

October
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SCOOP: FIRST PICTURE OF GENIE III (System-80 III?)

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MICRO-80

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**** CONTENT ****

Each month we publish at least one applications program in Level I BASIC, one in Level II BASIC and one in DISK BASIC (or disk compatible Level II). We also publish Utility programs in Level II BASIC and Machine Language. At least every second issue has an article on hardware modifications or a constructional article for a useful peripheral. In addition, we run articles on programming techniques both in Assembly Language and BASIC and we print letters to the Editor and new product reviews.

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***** EDITORIAL *****

This month, we have handed over much of our editorial space to Tony Edwards, our U.K. correspondent. Tony has presented us with a scoop; details and a photograph (our front cover) of the new (Video) Genie III. We will now hand over to Tony then return with some of our own comments later.

***** PEEKing (UK)

by our U.K. Correspondent Tony Edwards *****

Last month I gave a run down of the hardware situation in this country and this month I am continuing in the same vein, but talking about software. The '80 user in this country is very well served with regards ready made software for the '80. There is, of course, the large range of Tandy products, most of which are compatible with non-Tandy machines. My local friendly Tandy store manager does not think that these programs will run in Video Genie machines, however. He told me that the chips are different and 'built to different standards'. I do not believe him, as I have never had any difficulty using Tandy programs on my Video Genie. The only problems are the different keys and sound output.

As well as the Tandy software, there are a number of Software Houses in the U.K. some of which specialize in '80 software. These include Kansas City Systems, Microcomputer Applications, and Molimerx Ltd. All these provide an extensive range of programs from business to games and add new programs regularly. Molimerx (the name is Latin for 'Software') produces an almost club atmosphere in their monthly listings which, as well as over 400 programs, contains sections on problems and useful hints. The hallmark of all these suppliers is the back-up service. All accept the fact that bad tapes will sometimes be sent out and will exchange faulty tapes by return post.

American magazines are widely available here and they provide another source of software. The American suppliers can sell at much lower prices than the U.K. suppliers but, in some cases, the service is not so good and it is difficult to press a complaint over great distances.

Another source which is available is in the small ads. part of the various computing magazines. In these ads., freelance programmers sell their work at very reasonable prices. Some of these programs are very good indeed, and well worth the small cost.

The Genie II (EG 3008) is now available in this country. This machine is very similar to the Video Genie (EG 3033), known in Australia as the System 80. It uses Microsoft Level II BASIC and, as such, is compatible with most of the programs which have been produced for the '80 series of machines. The only obvious incompatibility is the loss of the second cassette. On this new machine the internal cassette has been replaced by a numeric keypad and only one external cassette port is available, thus programs which require two cassettes will not work on the new machine. The standard ROM has been expanded to 13K and now includes additional professional features, terminal features, and special function keys. The keyboard has 71 keys including a full typewriter section, numeric keypad, and four special function keys. Lower case is standard. This looks a fine machine aimed at the business market but I can see many hobby users enjoying it.

No sooner had I finished considering the Genie II than I was invited to see the press release of the Genie III. This machine will not be generally available for twelve months or more but already I think it is a winner. It is intended to be compatible with the Video Genie and the Genie II so I think the suppliers should be congratulated on their attempts to keep all the machines in the stable working together. The Genie III has no ROM being disk based with operating disks carrying the function usually found in ROM. The machine is the first to support both CPM (80 x 24 screen format) and Level II BASIC (64 x 16), thus giving it a huge software access. The machine has 64K of RAM and 1 megabyte of on-line disk, which can be doubled externally if required. It uses a Z80A processor operating at 4MHz and has both parallel and serial interfaces as standard. All this at a projected price of £1600 in the U.K. cannot be bad.

There are a number of new 'stick on' goodies becoming available at this time in the U.K. which I will be covering in a future piece. Lowe Electronics (the suppliers of the Video Genie) are marketing a converter for the TRS-80 to allow it to use Genie add-ons.

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On receipt of this story, we immediately rang Jim Rowe, Technical Director of Dick Smith Electronics. We knew Jim had very recently been to the U.K. and it seems that one of the major reasons for that trip was to attend the preview of the Genie III. Jim was able to expand somewhat on the information supplied to Tony.

The unit presented and photographed, is the engineering prototype. If the dealers have their way, the ultimate production models will be rather more compact and visually attractive. Price too, could be rather closer to what it would cost for a similarly optioned Genie II. It is not certain yet whether the BASIC interpreter will be on disk or will be contained in a ROM as at present. No decision has yet been made on the DOS to be used with the system (i.e. when not in CP/M mode). The disk drives operate in double density. Those in the prototype unit were TEAC but production units could have different drives.

What about our own opinion? We think it is a very intelligent move. For some years now, CP/M has been the de facto industry standard disk operating system. A great deal of software has been developed to operate under CP/M, particularly business software, interpreters (BASIC, COBOL, FORTRAN) and utilities. Two relatively recent events have virtually assured CP/M and CP/M compatible systems of a firm place in microcomputing for at least the next five years. First, there was the Z80 Softcard produced by Microsoft for the Apple. This makes Apple computers capable of running CP/M and has led to the development of a great deal of new software, both business and hobbyist, running under CP/M. Secondly, there is the emerging Japanese microcomputer industry. The greatest weakness the Japanese have in selling computers into Western countries is the availability of suitable software. Almost to a man, Japanese companies have designed their computers to operate under CP/M thus overcoming the problem. Now, programmers all over the world will be able to write programs to operate under CP/M and know that, with only minor modifications, they should run on over 60% of the disk-based microcomputers which will be sold in the next few years. The Genie III will fit right into this pattern and should do well. It will also offer the advantage of allowing the user access to the very large library of TRS-80 Model I software which is available. We think that the Genie III is well conceived and look forward to its early introduction. Incidentally, you may not have to wait 12 months to see them in the shops; apparently the manufacturers are now talking about delivery in April or May 1982.

We had so much to squeeze into the magazine this month that we have had to hold over one of our advertised programs - Towers of Hanoi, until next issue. Part 2 of The Theory and Techniques of Sorting will also appear next month.

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***** BETTER BASIC PROGRAMMING - PART 6 by Rod Stevenson *****

** MORE ASSEMBLY/BASIC **

0 '

1 'BREAK=SHIFT B. SHIFT@=SHIFT A. USE SHIFT E FOR ENTER WHEN FOL
LWS SAVE, CSAVE, LIST, LLIST; OTHERWISE THEY ARE DISABLED. CAN
BE MERGED ONTO FRONT OF ANY BASIC. BEFORE (C)SAVEING, POKE 255 I
NTO 17131-2.

2 SM=PEEK(16549):SL=PEEK(16548):SA=SM*256+SL+8:SL=SAAND255:SM=IN
T(SA/256):FORA=SATOSA+97:READD:POKEA,D:NEXTA

3 T1=PEEK(16405):T2=PEEK(16435):POKE16405,0:POKE16435,201:POKE16
406,SL:POKE16407,SM

4 DATA205,227,3,254,101,40,65,254,98,40,17,254,97,40,16,254,13,4
0,15,254,1,40,3,254,96,192,175,201,62,1,201,62,96,201,217,237,91
,164,64,175,103,46,83,25,235,42,167,64,43,215,26,19,183,250,204,
6,190,35,40,246,26,19,254,128,32,250,26,254,255

5 DATA32,230,217,62,13,201,76,73,83,84,128,76,76,73,83,84,128,67
,83,65,86,69,128,83,65,86,69,128,255

6 POKE16405,T1:POKE16435,T2:POKE17131,0:POKE17132,0:'FOLLOWING I
S A SAMPLE PROGRAM.

7 PRINT" TRY TO STOP!!!";:PRINT@512,,:PRINT"CONNECT AMPLIFIER TO
AUX PLUG. OR PLUG SPEAKER INTO EAR-SOCKET & PRESS RECORD-DISA
BLE LEVER ON RECORDER, THEN RECORD & PLAY.

THEN PRESS ANY KEY.

8 IF INKEY\$=""THENGOTO8

9 CLS:FORI=1TO23:READD:S\$=S\$+CHR\$(D):NEXT

10 X=VARPTR(S\$):POKE16526,PEEK(X+1):POKE16527,PEEK(X+2)

11 PRINTCHR\$(23);"LISTEN ";X=USR(RND(50))

12 PRINT"LISTEN ";:GOTO11

13 DATA205,127,10,14,140,69,62,1,211,255,16,254,69,62,2,211,255,
16,254,13,32,239,201

This program routine is here to illustrate many of the points left over from the last article. Some of these perhaps are outside the scope of the "elementary" nature of this series, but I'll present them anyway! So if you find some a little complex now, leave them till later and you will be glad to be able to understand, at a later date, with more computing "under your belt". While on that subject, I must stress again that true understanding (of this series, or of any other instruction-type book or magazine) really does require "hands on" experience and practice. So, don't just look at the listings in these articles. Type them in, RUN them and try to understand how they work, even before you read my explanation.

WHERE TO KEEP MACHINE LANGUAGE ROUTINES.

As I write machine language only as routines to be accessed from BASIC, this is an important consideration. Of course, if your machine language is stand-alone it won't be - you can just enter it with SYSTEM and the entry point.

There are basically three ways I store machine language:

1. In a definite memory location. Though this can also be a location determined by the program: last episode the program looked at the current top of memory to determine where to put the machine language program. But generally, you will have to protect memory, load in your program (whether by SYSTEM or POKE from BASIC) and it's done. The disadvantage here is that you are relying on the user to remember to set memory size (and realise, the documentation you carefully provided may go astray from the program), and at the correct value. You will also have to provide different programs for all memory configuration. But without a doubt it's the simplest way.

As well as locating your machine language program at the top of memory, you can put it at the start of BASIC, and relocate the start of BASIC pointers (put the new location into 40A4-5H and NEW to set other pointers). But again, you will have to provide separate programs for disk systems (and different ones for each disk system).

2. In a string. This is actually quite simple, and is satisfactory unless your routine is not relocatable or is more than 250 bytes long. And if it is you won't have been able to use relative jumps (+129 or -126) to make it relocatable so you will need an absolute location known at the time of assembling your program. Yes, I know you could use array space or storage, but this gets quite "hairy" because arrays are not stored contiguously in memory.

Having decided to use a string for storage, write a DATA line containing your machine language code in decimal numbers. Remember last issue I gave you the hint that an easy way to do this is to put your machine language into memory (either by the IM command of EDTASM or by loading your assembled SYSTEM tape) and PEEK the location so the decimal values are on the screen while you write your DATA line, such as lines 4, 5, 13 in the above program.

Then build a string composed of this DATA as line 9 above. You will see others don't build their string in this way. They assign the required space to the string, then determine where the string is, and POKE it in. While this works, and look at some of the back issues of MICRO-80 for an example, I (naturally) think my way is better in that it's easier to understand. But both methods do the job. CLEAR string space if necessary.

Now comes the tricky part. Though I don't think it is difficult once you understand it. What's necessary is to provide the entry address of the machine language routine to USR(0) (or whatever calling method you are using, and more of other ways later). The little understood function of VARPTR (meaning variable pointer) is used. And don't feel guilty for not understanding it - not many do from the explanation in the Level II Manual! What VARPTR does is to find out where the given variable is stored. And it will work with all types of variables, but in this case, we are interested in where our just created string is living.

So in line 10 I've used X as the variable for the value given by VARPTR. But with a string, the first value given is the length of the string (used by the LEN function) so actually it's the next 2 bytes that are needed. And these are not actually the start of the string, but a pointer to the start of the string. So we need to PEEK them, not use them directly. That is, use the value they are pointing at, not use them themselves. Yes, I know it may be somewhat confusing but think about it until it "clicks".

These two locations are given LSB first MSB last, which is the way the Z-80 expects them, so in the way they are used in line 10 they are correct, but to actually calculate the address you would have to reverse them. More of this later.

The addresses being pointed to are now POKEd into 16526-7, which is the location for USR(0) to find out where to jump to in memory to enter your machine language program.

Now a philosophical point. You will have heard in an earlier edition of MICRO-80 the article on the "garbage collector" which reorganises string usage when the space allocated by CLEAR (or the default 50) is getting full. So it could be that BASIC will relocate your string (and the machine language it contains) between accesses (but not during, since you won't

be in BASIC). So you will need to repeat line 10 before each access if you've used any string function. I haven't, so this is why in line 12 I go to line 11, not line 10. But you will remember in the article on input checking, when I listed my routine for line input, I provided alternative lines to keep the routine in a string. But I did warn that theory says it may not work - actually it did work! And now you see why - the "garbage collector" may have moved the string because I used VARPTR once to find the location of the input string, and again to find the location of the machine language routine. And accessing any string function is the same as accessing a string - you run the risk of the "garbage collector" taking action. If you didn't understand this whole paragraph, don't worry, it's only an explanation for the less beginning beginner.

3. In a REM line. You will also see this technique used in earlier editions of MICRO-80, in my opinion where it is not really necessary.

My reason for using it here (lines 0 and 2) is that this particular routine needs an absolute location. That is one where it will remain, so the operating system knows where to find it. Because this particular routine modifies the operating system and is constantly being used - it's not like one which is accessed only at particular points in the program.

Line 0 provides enough space to hold the machine language code contained in lines 4 and 5. And it really does mean space, not TABs. After running this program you will see that line 0 fills up with what looks like garbage, but it is actually the machine language program which also happens to contain some control characters (only by chance do some of the machine language instructions happen to be the same as screen-control codes). The same thing happens with the string created by line 9. If you PRINT\$, you will see what I mean.

Line 2 is the difficult one (if indeed anything here is difficult to understand). So stay with it. 16548-9 (40A4-5H) is the pointer to the start of BASIC. The reason for using the pointers, and not the actual start location, (42E9 for Level II) is to allow for disk, or any other machine language program (such as Level III) which is already loaded and has relocated the start of BASIC. So SM is the MSB, SL is the LSB of start of memory. Note the use of meaningful variables names still! And more later about MSB-LSB. Then the whole address is created in SA by multiplying SM by 256 and adding to it SL. Also 8 is added to get past the 5 bytes of pointers BASIC keeps at the start of every line. (Actually 5 would be enough to add but I added 8 for safety, just as I left more space in the REM line than the 98 bytes taken by the machine language routine).

The reason for calculating the whole address before adding 8, and not just adding it to the LSB is in case the LSB happens to be something like 250, which would become 2 when 8 is added and the MSB would be incremented if done in the correct way. If the LSB only is considered then the address would be in error.

Then having obtained the address in SA where the machine language can be put, I recalculate the MSB and LSB in SM and SL, for later use in the program.

Now it's a simple matter of putting the machine language code into the space provided by the REM line. Note the for-next counter at the end of line 2 is SA+97, whereas there are in fact 98 items of data. This is the trap I warned of last episode: the first data item will actually be put into SA! You cannot have a 0 as one of the data items if you want to keep the machine language in a REM line. Line 3 is impossible to write without Eddy Paay's ROM Manual to tell you that 16405,16435-7 are in the keyboard driver routine. The first two must be fooled into thinking no keyboard is present until the routine is POKED into memory, and its location is given to 16406-7.

Line 6 puts these first two locations right again, so that each time the operating system scans the keyboard it jumps to the machine language routine before acting on the results of that scanning of the keyboard. The last two locations are the pointer to the first line number for BASIC, which must be put right before RUNning the program if it has any GOTOs or GOSUBs. The reason they will be wrong is if you've POKEd them wrong as suggested in line 1 before saving this program. It's suggested so that a potential user cannot LIST the program before it's RUN, and then he can't LIST it after it's RUN because the routine will then be operating! So obviously, don't POKE them wrong in your own copy; and don't RUN before you save it (only because line 0 will fill up with apparent garbage).

After you've RUN it once, you can delete all but line 0, but you can't save it as such, because the operating system still needs to be told where to find the machine language program (contained in line 0) (by line 3) when it's nearly loaded.

HOW THE ROUTINES WORK.

I haven't space to explain how these two (break-disable, and sound) work here. Just wait for a future instalment when an explanation and the source code may be forthcoming. They've been included here simply to illustrate the connected points, not for their own right.

But until then, if you want to change the disabling of SHIFT0 to some other key disabling, change the 25th DATA item in line 4 from 96 to the ASCII value of whatever key you want to disable.

Also experiment with changing the value in USR in line 11 to something else and see how the tone generated changes. For example, in line 12 you could put before GOTO11, INPUT"NOTE(0-255)";N, and change the USR to read USR(N).

Remember how I said user experimentation is the key to true understanding.

TWO BYTE ADDRESSING.

The concept of addressing is simple once you understand - like everything! The whole point about it is that because we have up to 65,535 addressable memory locations in RAM, we need two bytes to address, since each byte can hold only 8 binary digits, that is, 256 decimal. So by combining two of these bytes we can get 256 multiplied by 256. So we must decide how we are going to identify which is the one to be multiplied by 256, and which is the one to be added to that result. By convention, we call the one which is multiplied the Most Significant Byte and the other the Least Significant Byte, usually referred to as MSB and LSB. So MSB multiplied by 256 and added to LSB gives the real address in decimal. Conversely, to get the MSB from the real address, take $\text{INT}(\text{address}/256)$; to get LSB, subtract MSB multiplied by 256 from the whole address. Or a simpler way of getting LSB is to take the whole address AND 255, as line 2 above. Details of why this works are below.

The only other complication with the addressing is that the Z-80 takes the two bytes "the wrong way round" - that is, LSB first, MSB second. But it's only a case of remembering. If you look at an assembled source listing you'll see in the operand column the address is given "right way round", but in the assembled hex code in the second left column it's "wrong way round".

AND.

Here seems a good place to explain the use of AND above. It's not the AND/OR of BASIC such as $\text{IFA}=\text{B AND C}=\text{D}$, but the binary AND which compares bit patterns in the byte. Just the same is used in assembly writing, a knowledge of which is essential, for any but the simplest assembly program. The only thing here is that AND is used in BASIC, but it's still comparing bit patterns. The whole concept of AND in BASIC can be examined by trial print instructions in the command mode. For example, if you PRINT4AND8 you'll get 0, but if you type PRINT4AND7 you'll get 4.

4 = 00000100	4 = 00000100
8 = 00001000	7 = 00000111
AND = 00000000	AND = 00000100

This is because what is really happening is as illustrated at left. The computer is comparing bit patterns of the two numbers you specified (4 and 8) and setting answer bits only when it finds two ones set in that column. If you say OR instead of AND it will set answer bits if it finds one bit set in the column, regardless of what the other one is.

4 = 00000100
7 = 00000111
OR = 00000111

4 = 00000100
7 = 00000111
XOR = 00000011

XOR means exclusive OR, and will set a bit if it finds one and only one bit set in the column. This is useful if you want to set the accumulator to 0, but not by loading it with 0, because you are keeping it in a REM line which would interpret 0 byte to be the end-of-line marker.

THE STACK.

Being familiar with machine language, you will know of the stack which is used as a temporary storage area in machine language programming. So it is in BASIC too. It normally locates itself 55 bytes below the top of memory (or protected memory). This is the 50 bytes default string space, plus the 2 bytes extra set aside from very top of memory, plus 2 bytes separating string space and stack space. The stack grows downwards (high memory address to low). However, as said last episode, you don't need to worry too much about conflicting with the stack unless you are putting your machine language into memory and setting memory size from within a GOSUB or middle of a complex BASIC line. Of course, your machine language should have balanced its PUSHes and POPs before it returns to BASIC, but so it should anyway.

PROTECTING MEMORY.

By answering the memory size question, you're really specifying the highest memory location BASIC can use. Actually it will use two locations under what you've set. If you look at a memory map you'll see that immediately under the top of memory is the string space, which BASIC uses to work on any strings from your program. So this is what will overwrite your machine language routine if you don't set memory protection. Of course, if you've kept it in a string or REM line you won't need to protect memory.

POINTERS.

You will notice in the above program that I've used pointers rather than absolute addresses. This is a very convenient way of writing as it allows your program to be portable from your own machine to other machines of different memory and equipment configurations.

I won't go into the huge task of detailing the pointers here. Eddy Paay's ROM Manual does though, so I suggest you look there.

Also in the ROM Manual you'll find the entry for other ways to get into machine language without using `USR(0)`. And others are useful in that disk BASIC has a different syntax for `USR`, so your program would need to be changed for a disk machine if it uses `USR`. However, the others are not as easy to pass variables to and from the machine language routine and BASIC although it can be done in several other ways. An example is to `POKE` the LSB and MSB into 16789-90 instead of 16526-7. This will cause a jump to the machine language when the computer encounters the & which is a disk BASIC command, and has its entry point at 16789-90.

If, like me, you think this is really rivetting stuff, you will certainly be well rewarded by the ROM manual.

WHY TALK HEX.

This is an often asked question. I used to ask it myself but when you get really "into" machine language and develop a "feel" for it, you will realise why and I'm sorry that's all I can give you for a reason. But so many (me included) do. I hope you will just take my word for it. I could tell you it's easier to remember a 4 digit number than a 5 digit decimal one, but you probably won't accept that. Just remember my words when you are an accomplished hex talker and somebody asks you why.

MONITORS-UTILITIES.

You'll read of various machine language programs, some of which are referred to as monitors and some as utilities. It seems there is some overlap, but I consider a monitor to be one which allows you to modify a machine language program, set break points, single step, etc. such as `ZBUG`. I consider a utility to be one which allows you to do things other than fix a machine language program. So to my mind, most programs about are utilities. And the one I use is `MON3` (`MON4` is available for disk). Eddy Paay has combined `MON3` with a high memory version of `TBUG` to give the best of both worlds. `MON3` is produced by Howe Software, and is available in Australia from Computer Campus at Kent Town, S.A.

Another I use is `PACKER`, but this is obviously not in the same area. Although `ZBUG` (which comes with Microsoft Editor/Assembler Plus) is a really good and powerful monitor, I can't honestly recommend it because it's so difficult to use - even Eddy says so! But as `EDTASM`, which it comes (free?) with is so good, it doesn't really matter.

Therefore if you want to know what I'd suggest you get to help in combining your machine language with your BASIC (though often you won't need anything) and to allow you to "fiddle" with others' machine language, I'd recommend `MON3`. Admittedly it has its limitations, as do most, but then what are the chances that you'll find any to suit your requirements exactly! I do get by quite well with `MON3` most of the time because fiddling about with others' machine language is what I like best.

CONCLUSION.

Still to come are sound routines with a source listing and explanation, and details of break key handling with a source listing. I haven't space to detail or explain the two routines listed above so this will come next time. And also to come is a function simulating `ON BREAK GOTO`. I hope the above has been of value. Remember my constant preaching that nothing is a better teacher than experience, practice and thought.

At the end of this series there will be an episode devoted to answering readers' questions. So please send some in.

AN EXPLANATION - by Rod Stevenson

A number of readers have assumed from my references to the Adelaide Users' Group that it is the same as `MICRO-80`. I want to point out that the two are in no way connected. The only common factor is that both are in Adelaide; therefore Editor, Ian Vagg, attends meetings and gets ideas from speakers at the Group. This is how I came to be writing this series, and how Allan Dent's articles on the joystick and port project appear. Other members of the Group (Bernie Simson, Bruce Bussenschutt, etc.) just happen to write and submit articles just as many others from all over Australia do. (What he means is, we are just good friends!! - Ed.)

***** JOYSTICKS AND INPUT/OUTPUT PORTS FOR YOUR '80 by Alan Dent *****

PART 3 - A/D - I/O BOARD ASSEMBLY INSTRUCTIONS AND DETAILED PPI PROGRAMMING DESCRIPTION

Firstly I cannot overstress the importance of a low wattage soldering iron with a small tip. If your iron is not one of the small pencil type and has an unplated copper tip, file the end to a small surface preferably about 1/16th and no larger than 1/8th of an inch tip width. Keep the tip clean, tinned and wipe it regularly with a piece of cloth during construction. Alternatively, you may be able to borrow a more suitable iron from a friend. Failure to use a suitable iron can be disastrous by causing tracks to lift and creating solder bridges etc. You may even be able to use this as a good reason to upgrade your old iron. A small pair of clean cutting wire cutters will also be required, and a pair of long nose pliers would be helpful.

The easiest way to assemble the P/C board is to start with the wire links joining the tracks through the board. As mentioned in the last instalment, for reasons of economy, the board does not have plated through holes. First, place some spacers about the thickness of a match on your bench and lay the P/C board on top of them, component side uppermost. An alternative method would be to temporarily fasten some matches to the underside of the P/C board with masking tape, taking care not to cover any holes to be used for the wire links. Insert the wire through the hole linking the tracks so that the wire touches the benchtop. Solder the wire in place and then cut the wire just above the solder joint, do not solder the other side at this point in time. Repeat this process for all tracks which have holes in them with the following exceptions:

- 1) integrated circuits
- 2) top soldered resistor between IC2 and IC3
- 3) capacitor between IC3 and IC4 (middle hole in track)
- 4) capacitor between the PPI's, IC8 and IC9
- 5) the optional capacitors near the port connectors
- 6) -ve connection at the board edge near the regulator
- 7) corner hole for the PORT 13 connector

When finished soldering-in all the links on the top of the board, turn it over and lay it flat on the bench. Bend all the leads back along their respective tracks, flat against the P/C board and solder them. Some links may be too long to do this and will have to be cut to a more suitable length.

Next, solder in the IC sockets with pin 1 as indicated. Do them one at a time as it is much easier to hold only one socket in place while turning the board over to solder it in. With the sockets in place, you now have reference points which make it easier to locate the holes for the other components. TRS-80 owners will not have to use IC10; this is only used by System-80 users. The resistors should be installed next and then the small capacitors. Don't mount the components flush with the P/C board but raised up so that the resistors are about the same height as the IC sockets. This allows for easier servicing if it should ever become necessary (heaven forbid). The extra lead length allows a CRO probe to be easily clipped on for monitoring the various pulses. This is a good habit to get into whenever you construct any electronic device, space permitting of course (this is written by an electronic serviceman in case you haven't guessed). Be careful to insert the 10µf correctly polarised. Now install the bridge rectifier, polarised as indicated on the underside of the board, then the 2000µf similarly polarised. Finally the regulator IC polarised as shown in the stuffing diagram followed by the PORT and A/B connectors and the 4 pins for the AC/DC connections next to the rectifier. System 80 owners will also have to fit a 3 pin male connector alongside IC10. Orient the board to place the port connections at the top, the connections for this 3 pin connector from top to bottom are: READ - WRITE - I/O REQUEST.

As the board was originally designed for a TRS-80 model 1, model 1 owners may now insert the 40 pin header plug into the BUSS CONNECTOR socket, the ribbon cable feeding out over the PPI port side of the board. Non model 1 owners who are anxious to construct this peripheral will have to do it the hard way as described later in the text, but for those not in such a hurry, MICRO-80 are working on an adaptor which will allow you to directly connect it to a ribbon cable from the computer expansion port. Model III owners will have to strip back the ribbon cable and solder the various wires to the header pins from the connection information supplied. The wires to be connected are the 8 data lines, the lower 8 address lines and the control lines WAIT, IN, OUT and RESET. System 80 owners will also have to do as the Model III owners did plus you will have to generate the IN and OUT signals in IC10. To do this the I/O request line and the READ and WRITE lines have to be combined in IC10 by connecting them to the 3 pin connector as indicated on the stuffing diagram and also mentioned in a previous paragraph.

Now for the power connections. The circuit is designed for either A/C or D/C input. Those who are going to use A/C from a low voltage transformer of about 8 to 12 volts will use the connections indicated by the sinewave on the underneath of the board. You also have the advantage of being able to tap off the unregulated D/C if required. Those using an external D/C supply such as a "plug pack" type should use the D/C pins correctly polarised as indicated with the + and - signs. A 9 volt battery snap connector such as TANDY 270-235 or DICK SMITH P-6216 is quite suitable for this. Connect your power pack to the connector, check that it is switched to 9 volts and the polarity connector is + to + and - to -. If you have a multimeter you can check the polarity for yourself before you connect it to your precious board. You may also like to monitor the 5 volt supply as you switch on the power, or even check the regulator before

you plug in the other chips.

Now insert the I/c's in their sockets. TTL first (practice with the cheap ones). If the pins are spread too wide for the socket, gently bend each row of pins inwards using a pair of long-nose pliers being careful not to overdo the job. When handling the LSI chips the normal static electricity precautions should be observed. Don't remove them from their static protected package until you have finished everything else and you are ready to fit them. Earth yourself and the board to ensure that all static electricity is discharged; remove the LSI chips and insert them in their respective sockets. Although most MOS LSI chips have static protection built in these days, it is still good practice to observe the above precautions. For those of you who are worried about earthing everything while living in the modern vinyl/synthetic house, the kitchen sink is an excellent place to do this. Those of you who have traded in your sink on a dish washer have a slight problem!

Now comes the real test!!! Switch on the power to the board without it being connected to your computer. If, when you switch on, everything just sits there calmly, very good. You may now proceed to the next step, but if the power pack hums loudly and/or smoke pours from the board, first panic and then switch off and try to find out what went wrong. Hopefully this will not happen to anybody. Next switch off everything, connect your ribbon cable to your computer edge connector. Plug in the cable that connects your JOYSTICKS to the A/B inputs, switch on the plug pack first, followed by the computer. Type in your simple test program and run it, call your family and friends and show them what a clever boy you are.

Now for some more detailed programming information on the operation of the board. The A/D input is straight forward in that it is addressed as an input port exactly as described in the LEVEL II handbook. It is also addressed in assembly language as an input port. In both cases, the 8 bit value of the analogue input voltage of the addressed port is returned to the computer. In the case of the LEVEL II program, the 8 bit value is returned in decimal value to the variable used in the input statement. The assembly program input command returns the digital value directly to the accumulator. The BASIC command would be in the form of Variable=INP(Port number) e.g. X=INP(0). Assembly language programmers would use IN A(Port number).

As you can see, using the A/D function is fairly straight forward but programming the Parallel I/O Ports is a little more complicated. The Programmable Peripheral Interface (PPI), INTEL or NATIONAL SEMICONDUCTOR 8255 is capable of 3 modes of operation. The first of these is Mode 0, which is also the simplest to use. It allows data to be written to or read from any of the available ports (A, B or C) without the use of any "handshaking" signals. Before any data is transferred to or from the PPI, it must first be "set up" or programmed. As in any computer operation, the use of the PPI must be pre-planned into the program using the device. With this knowledge of the PPI requirements, we know in advance in which "direction" we want the ports programmed. As an example, we may require 8 input or sense lines and 16 output or control lines. This requirement can be met in 3 different ways, A IN with B and C OUT, or B IN with A and C OUT, or C IN with A and B OUT. As you can see the PPI is very adaptable, but how do we "set up" this chip to do what we want? The PPI is programmed by writing a CONTROL WORD into the CONTROL REGISTER. Sounds simple doesn't it - well it is. If you look at the Mode 0 Port Definition Chart, a quick scan down the Group A - Group B columns will reveal the 16 possible combinations of input and output ports. Remember from last month, port C can be split into 2 groups of 4 lines giving in effect 4 ports. Looking at these columns, we can pick out the control word to suit our requirement. The control words to fit the 3 variations mentioned above are 144, 130, 137, respectively or, if you prefer, HEX 90H, 82H, 89H. If you're a binary freak, you will notice a tie-up between the control word BIT columns and the 4 port columns. Data bit 4 controls the direction of port A, a "1" for IN and a "0" for OUT. Data bit 3 similarly controls the upper 4 bits of port C, data bit 1 controls port B and data bit 0 controls the lower 4 bits of port C. Now that you know what control word is needed, it has to be written into the control register. Looking at the Port Select chart, we see that the control register sits at chip address 3. Our PPI's are placed at addresses 8 and 12 (IC9 and IC8 respectively). This means that their control registers are located at 3 address locations above this, or Port addresses 11 and 15. If we want to set both PPI's to the same condition, e.g. A IN, B and C OUT, we would write to both control registers at addresses 11 and 15, the control word 144 decimal or 90 HEX. On receiving the new control word, the PPI clears all internal registers and sets the various ports to the direction specified by the control word. If we now request an input from port A, (IN port 8 or IN port 12), the 8 bit word being presented to the ports external pins is latched into the A register and then placed on the data bus for the computer. To write to the ports is equally simple - to output to port B, simply OUT 9,XXX or OUT 13,XXX and the value is latched into the output latch of port B. Port C is similar except that it uses port addresses 10 and 14 depending on which chip you use. At this point I should correct a typing error in the second part of this article. In the fourth line from the bottom of page 10, the reference to "PORT B" should be changed to "PORT 8". I hope this clears up any confusion that may have been caused.

The output of the PPI port C can also be varied by the BIT SET/RESET control word. If you look at the diagram you will see how to select the control word to perform your required function. The bit set/reset function is selected by data bit 7, a "0" selects the bit set/reset mode. The next 3 bits D6,D5,D4 are not used and should be 0, bits D3,D2,D1 select in binary, the bit that you want to change while bit D0 selects whether you want to set it "1" or reset it "0". As an example we will set data bit 7 on port 10. To do this the control word is as follows: D7=0 (selects bit mode) D6,D5,D4=0 (not used) D3,D2,D1=1 (selects data bit 7) D0=1 (sets the

bit), this gives us the control word 15 or 0F Hex and Bit 7 is set regardless of its previous condition while the remaining bits remain unchanged.

The remaining modes 1 and 2 will not be covered here as they do not generally apply in the type of design presented, although I'm sure someone could if the need arose. If you want to use these modes, I suggest that you consult the manufacturer's data books for details. In the future if a project that uses these other modes is developed by somebody and submitted to MICRO-80, I am sure that a detailed description of these modes of operation will be included with the article.

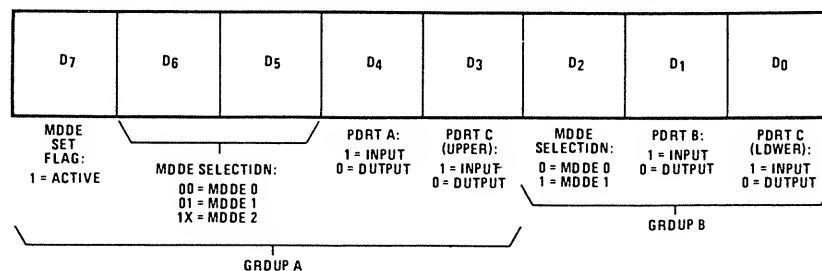
8255 PROGRAMMABLE PERIPHERAL INTERFACE - DATA

mode 0 port definition chart

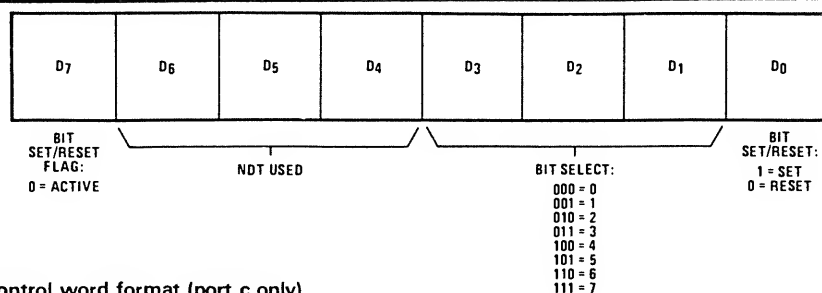
DECIMAL No	HEX No.	Control Word Bits								Group A		Group B	
		D ₇	D ₆	D ₅	D ₄	D ₃	D ₂	D ₁	D ₀	Port A	Port C (Upper)	Port B	Port C (Lower)
128	80	1	0	0	0	0	0	0	0	OUTPUT	OUTPUT	OUTPUT	OUTPUT
129	81	1	0	0	0	0	0	0	1	OUTPUT	OUTPUT	OUTPUT	INPUT
130	82	1	0	0	0	0	0	1	0	OUTPUT	OUTPUT	INPUT	OUTPUT
131	83	1	0	0	0	0	0	1	1	OUTPUT	OUTPUT	INPUT	INPUT
136	88	1	0	0	0	1	0	0	0	OUTPUT	INPUT	OUTPUT	OUTPUT
137	89	1	0	0	0	1	0	0	1	OUTPUT	INPUT	OUTPUT	INPUT
138	8A	1	0	0	0	1	0	1	0	OUTPUT	INPUT	INPUT	OUTPUT
139	8B	1	0	0	0	1	0	1	1	OUTPUT	INPUT	INPUT	INPUT
144	90	1	0	0	1	0	0	0	0	INPUT	OUTPUT	OUTPUT	OUTPUT
145	91	1	0	0	1	0	0	0	1	INPUT	OUTPUT	OUTPUT	INPUT
146	92	1	0	0	1	0	0	1	0	INPUT	OUTPUT	INPUT	OUTPUT
147	93	1	0	0	1	0	0	1	1	INPUT	OUTPUT	INPUT	INPUT
152	98	1	0	0	1	1	0	0	0	INPUT	INPUT	OUTPUT	OUTPUT
153	99	1	0	0	1	1	0	0	1	INPUT	INPUT	OUTPUT	INPUT
154	9A	1	0	0	1	1	0	1	0	INPUT	INPUT	INPUT	OUTPUT
155	9B	1	0	0	1	1	0	1	1	INPUT	INPUT	INPUT	INPUT

Port Select (A₀, A₁): These two inputs, which are normally connected to the least significant bits of the A₁₅-A₀ Address Bus, control the selection of one of three 8-bit ports (A, B and C) or the internal control word register as indicated below.

A ₁	A ₀	Selected
0	0	Port A
0	1	Port B
1	0	Port C
1	1	Control Word Register



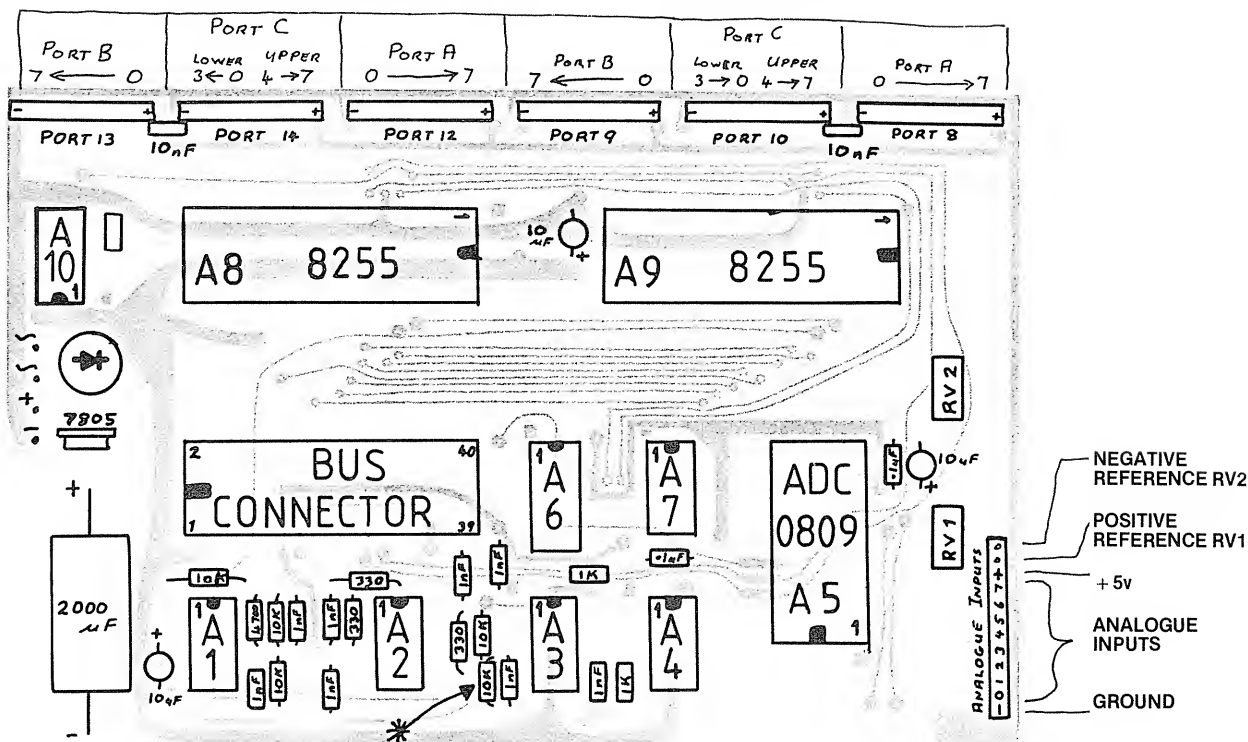
mode definition control word format



bit set/reset control word format (port c only)

COMPONENT STUFFING DIAGRAM

PLEASE TAKE NOTE OF THE PORT PIN NUMBERING

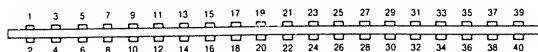


This is the only top soldered component. Unless the optional 10nF capacitors alongside the parallel ports are fitted, they have to be top soldered also.

TRS-80 EXPANSION PIN EDGE

P/N	SIGNAL NAME	DESCRIPTION
1	RAS*	Row Address Strobe Output for 16-Pin Dynamic Rams
2	SYSRES*	System Reset Output, Low During Power Up Initialize or Reset Depressed
3	CAS*	Column Address Strobe Output for 16-Pin Dynamic Rams
4	A10	Address Output
5	A12	Address Output
6	A13	Address Output
7	A15	Address Output
8	GND	Signal Ground
9	A11	Address Output
10	A14	Address Output
11	A8	Address Output
12	OUT*	Peripheral Write Strobe Output
13	WR*	Memory Write Strobe Output
14	INTAK*	Interrupt Acknowledge Output
15	RD*	Memory Read Strobe Output
16	MUX	Multiplexor Control Output for 16-Pin Dynamic Rams
17	A9	Address Output
18	D4	Bidirectional Data Bus
19	IN*	Peripheral Read Strobe Output
20	D7	Bidirectional Data Bus
21	INT*	Interrupt input (Maskable)
22	D1	Bidirectional Data Bus
23	TEST*	A Logic "0" on TEST* Input Tri-States A0-A15, D0-D7, WR*, RD*, IN*, OUT*, RAS*, CAS*, MUX*
24	D6	Bidirectional Data Bus
25	A0	Address Output
26	D3	Bidirectional Data Bus
27	A1	Address Output
28	D5	Bidirectional Data Bus
29	GND	Signal Ground
30	D0	Bidirectional Data Bus
31	A4	Address Output
32	D2	Bidirectional Data Bus
33	WAIT*	Processor Wait Input, to allow for Slow Memory
34	A3	Address Output
35	A5	Address Output
36	A7	Address Output
37	GND	Signal Ground
38	A6	Address Output
39	+5V	5 Volt Output (Limited Current)
40	A2	Address Output

NOTE: * means Negative (Logical "0") True Input or Output



Mates with AMP P/N 88 103-1 Card Edge Connector or Equivalent

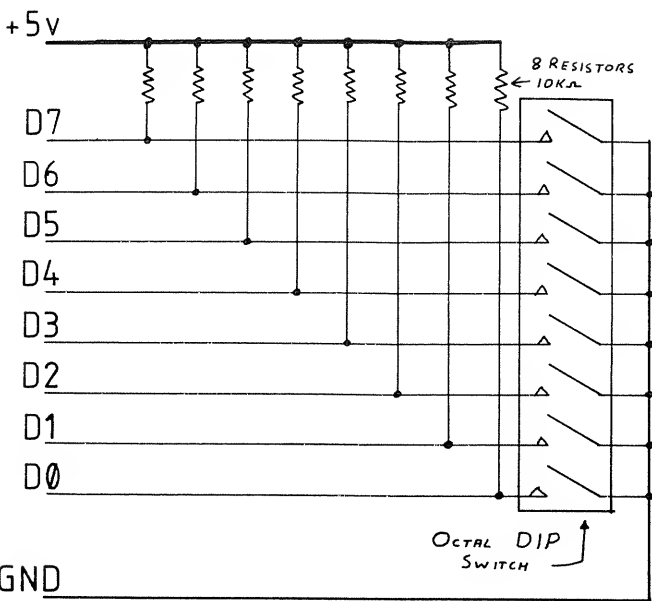
Connection points for Expansion-Port Edge Card (viewed from rear of keyboard assembly)

SYSTEM-80 EXPANSION PIN EDGE

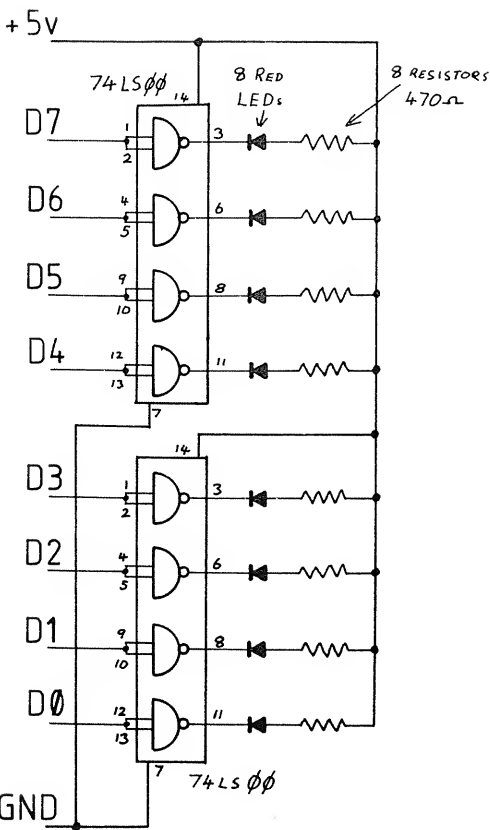
VIEWED FROM REAR SIDE		50
PIN	SIGNAL	49
1	GND	A10
2	GND	A13
3	A7	A11
4	A6	A12
5	A5	PHI
6	A4	PINT
7	A1	NC
8	A3	NC
9	A2	PHLDA
10	A0	PHANTOM
11	D5	HALT
12	D2	PWAIT
13	NC	IORQ
14	D1	PHOLD
15	D0	WR
16	D3	RD
17	D7	CCDBS/STADBS
18	D6	MREQ
19	VCC	DODBS/ADDBS
20	D4	M1
21	A15	RESET
22	A8	RFSH
23	A14	NMI
24	A9	GND
25	NC	GND

SIGNAL EXPLANATION

PHI	1.79MHz CLOCK
PINT	INTERRUPT
NC	NO CONNECTION
PHLDA	PROCESSOR HOLD ACKNOWLEDGE
PHANTOM	PHANTOM
HALT	HALT ACKNOWLEDGE
PWAIT	PROCESSOR WAIT
IORQ	INPUT/OUTPUT REQUEST
PHOLD	PROCESSOR HOLD
WR	PROCESSOR WRITE
RD	PROCESSOR READ
CCDBS/STADBS	CONTROL AND DATA BUS DISABLE
MREQ	MEMORY REQUEST
DODBS/ADDBS	DATA AND ADDRESS BUS DISABLE
M1	FIRST STATE OF INSTRUCTION CYCLE
RESET	CPU RESET
RFSH	DYNAMIC MEMORY REFRESH
NMI	NON-MASKABLE INTERRUPT

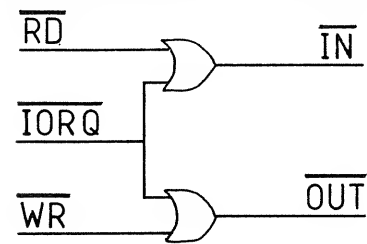


PORT INPUT SWITCH

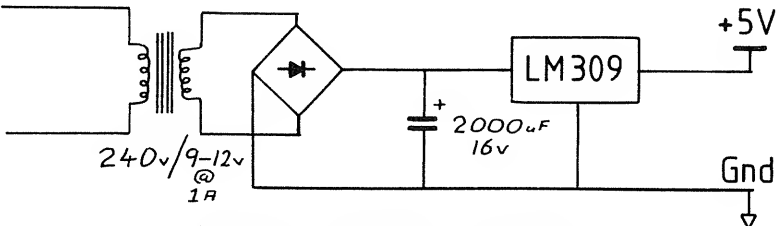


PORT OUTPUT MONITOR

SYSTEM80 TO TRS-80



74LS32

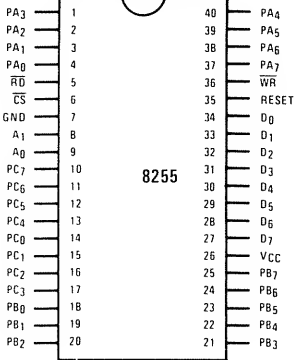


5 VOLT POWER SUPPLY

8255A BASIC OPERATION

A ₁	A ₀	RD	WR	CS	INPUT OPERATION (READ)
0	0	0	1	0	PDRT A ⇒ DATA BUS
0	1	0	1	0	PORT B ⇒ DATA BUS
1	0	0	1	0	PORT C ⇒ DATA BUS
1	0	0	1	0	OUTPUT OPERATION (WRITE)
0	0	1	0	0	DATA BUS ⇒ PDRT A
0	1	1	0	0	DATA BUS ⇒ PDRT B
1	0	1	0	0	DATA BUS ⇒ PDRT C
1	1	1	0	0	DATA BUS ⇒ CDNTROL
					DISABLE FUNCTION
X	X	X	X	1	DATA BUS ⇒ 3-STATE
1	1	0	1	0	ILLEGAL CONDITION
X	X	1	1	0	DATA BUS ⇒ 3-STATE

pin configuration



Joysticks and I/O Ports (cont.)

We will conclude this series of articles with some sample programs in both BASIC and machine language to illustrate some of the possible applications of this hardware project. The final part will also include full-sized PC board masters for the TRS-80 Model I. At a later date we will describe how to construct separate adaptor boards for SYSTEM-80 (Video Genie) and Model III computers. It is our intention to make the PC boards available to our readers to assist with the project. The price of the board will be announced in a future issue.

-0000000000-

***** '80 USERS' GROUPS *****

The following is a list of '80 Users' Groups. If you have a group that is not included here, please let us know about it so that we can publish details. Owners of System '80s are welcome at all the groups.

** AUSTRALIA **

AUSTRALIAN CAPITAL TERRITORYCANBERRA GROUP

Contact: Bill Cushing, 10 Urambi Village, Kambah, ACT.
2902.
MEETINGS: 3rd Thursday of each month at 7.30 p.m. in:
Urambi Village Community Centre, Crozier Circuit
Kambah.

NEW SOUTH WALESCOMPUTERTOWN CAMDEN (CTAUS!)

Contact: Keith Stewart
P.O. Box 47, Camden, N.S.W. 2570.

SYDNEY MAPPER CP/M GROUP

Contact: Dan Lawrence, Mapper CP/M Users' Group,
c/o G.P.O. Box 2551, SYDNEY, N.S.W. 2001.

SYDNEY EASTERN SUBURBS

Contact: Dan Lawrence,
TRS-80 Eastern Suburbs Group,
c/o G.P. Box 2551, SYDNEY, N.S.W. 2001.

WOLLONGONG GROUP

Contact: Paul Janson,
P.O. Box 397, DAPTO, N.S.W. 2530.

NORTHERN TERRITORYDARWIN GROUP

Contact: Tony Domigan,
P.O. Box 39086, WINNELLIE, N.T. 5789.

QUEENSLANDBRISBANE GROUP

Contact: Lance Lawes,
Tel: Home (07)396 2998
Bus. (07)268 1191 Ext. 15
MEETINGS: 1st Sunday each month at 2 p.m. at 21 Rodney
Street, Lindum.

SOUTH AUSTRALIAADELAIDE GROUP

Contact: Rod Stevenson,
36 Sturt Street, ADELAIDE, S.A. 5000.
Tel: 51 5241 bet. 9-4.

VICTORIAEASTERN SUBURBS GROUP

Contact: Mr. John Fletcher
Tel: Home (03)737 9544
Bus. (03)89 0677 (9-4)
MEETINGS: 4th Wednesday of the month at 7 p.m. at
Kingswood College, 355 Station Street, Box Hill

MICOM 80 USERS' GROUP

Contact: Len Sanders
Tel: (03)560 8132
MEETINGS: 1st Wednesday of each month at Alvie Hall,
High Street, Mt. Waverley.

NORTHERN AND WESTERN SUBURBS

Contact: Mr. David Coupe
Tel: (03)370 9590
MEETINGS: C.P.M. Data Systems, 284 Union Road, Moonee
Ponds - Alternate Thursdays at 7 p.m.

PENINSULAR GROUP

Contact: M.G. Thompson - (03)772 2674
MEETINGS: 2nd Tuesday of the month (except Jan.)

GEELONG COMPUTER CLUB

Contact: The Geelong Computer Club,
P.O. Box 6, GEELONG, VIC. 3220.
MEETINGS: 2nd Tuesday of the month at Tybar Engineering
Hampton St. Newton.

** UNITED KINGDOM **

NATIONAL NATIONAL USERS' GROUP

Contact: Brian Pain, 40 High Street, Stoney Stratford,
Milton Keynes.

CO. DURHAM NORTH-EAST TRS-80 GROUP

Contact: Barry Dunn, B Ethick Ice. North Craighead,
Stanley, Co. Durham, DH9 6BE. Tel: 0207-30184

COMPUTERTOWN UNITED KINGDOM (CTUK!)

Contact: Dave Tebbutt, c/o 14 Rathbone Place, London
W1P 1DE

NATIONAL NEWCASTLE PERSONAL COMPUTING SOCIETY

Contact: John Stephen Bone - 0632 770036

BOLTON NORTH-WEST TRS-80 GROUP

Contact: The Secretary, North-West TRS-80 Users Group,
40 Cowlees, West Houghton, Bolton BL5 3EG.

COMPUTERTOWN NORTH-EAST (CTNE!)

Contact: c/o 2 Claremont Place, Gateshead, Co. Tyne &
Wear NEB 1TL. Tel: 0632-770036/643417/679119/
559167

TANDY OWNERS PROGRAM & INFORMATION CO-OP.

Contact: Derek Higbee, 12 Shelley Close,
Ashley Heath, Ringwood.
Tel: Ringwood 6720.

***** MICRO-BUGS *****

In which we correct those errors which seem to creep in, no matter how careful we are.

SUPER SIZZLER - Issue 6, pages 39-43.

There are two bugs in this program:

- (a) upon trading in the chassis, the amount of the debt is indeed decreased by \$750 dollars, but in fact the jacks are removed.
- (b) Upon trading in either the wheels or the body, the correct part is removed, but the debt is increased rather than decreased, with the result that the program enters an endless loop, with the poor player's indebtedness increasing without limit.

The following amendments to the program will remove these difficulties:

- (a) Line 1010 - make this read "IF PS=-1 THEN 1130"
- (b) New line 1011 - "X=41: FOR Y=10 TO 13 etc." (to the end of the old line 1010)
- (c) Line 1130 - change this to: "FOR X = 208 TO 237:PRINT @ X, " ";: NEXT: GOSUB 1011: RETURN" (note the change to the GOSUB address).
- (d) Line 1370 - add the instruction "PS=-1" immediately after "GOSUB 1200".
- (e) Line 1450 - once again, add "PS=-1" immediately after "XX = 0".

Some additional changes necessary to make the program perform sensibly on a "SYSTEM 80" are as follows:

- (a) Line 320 - change CHR\$(94) to CHR\$(62) and CHR\$(93) to CHR\$(60) - (in two places for each).
- (b) Lines 520, 590, 600, 630 and 640 - change "[" to CHR\$(168).
- (c) Lines 570 and 580 - change CHR\$(8) to CHR\$(44) and CHR\$(9) to CHR\$(46).
- (d) Line 2130 - add ELSE CLS immediately following RUN.
- (e) Line 130 - change to read: ".....MONEY. USE THE LEFT AND RIGHT ARROW KEYS ";

ASTRONOMY 1.0 - Issue 15, pages 21-31.

There has been considerable interest in this program and many readers have contacted the author directly. He reports that Lines 811, 2320, 4036 and 4110 should be changed to remove a problem in section 3 with rising and setting of fixed objects and to improve accuracy. Edit the lines to read as follows:

```
811 INPUT "ENTER DAY, MONTH, YEAR";D,MO,Y:F1=D:F2=MO
2320 GOSUB 7200
4036 V1=V : V=V+282.510396
4110 T=COS(V1*J1)*0.016720+1 : T2=0.9997156 : F=T/T2
```

U.K. reader, Reg Fidler, points out a typographical error in the text accompanying the program. In paragraph 3 (Greenwich Sidereal Time to Greenwich Mean Time conversion) the answer is given as 12 hours 57 mins. 59 seconds. This should be 12 hours 51 mins. 59 seconds.

Reader, R.J. Sykes, suggests an error trapping routine to overcome an "FC ERROR" which can appear on one calculation.

```
15105 ON ERROR GOTO 19000
19000 QP=ERR/2+1:IF QP=5 THEN PRINT "THIS OBJECT EITHER DOES NOT RISE OR SET AT YOUR LOCATION."
19010 PRINT "CHECK YOUR CO-ORDINATES OR CHOOSE ANOTHER OBJECT."
19020 RESUME 18000
```

UTIL 1, 2, 3 & 4 - Issue 21, pages 28-34.

During the printing of these program listings some lines did not reproduce.

UTIL 1

4315	28 11	JR Z,4328	READY
4325	C3 58 04	JP 0458	Return to ROM
4331	CD 65 43	CALL 4365	FLASH
433A	32 83 43	LD(4383),A	Save the character to repeat
4345	F2 42 43	JP P, 4342	KLOOP
434B	2A 81 43	LD HL,(4381)	Save repeat count
4357	32 7F 43	LD(437F),A	Reset counter
435D	3A 83 43	LD A, (4383)	Fetch the character to repeat

4360	22 81 43	LD(4381),HL	Adjust the repeat counter
4366	2A 7F 43	LD HL,(437F)	Fetch the flash count
4375	21 00 03	LD HL, 0300	Flash rate delay
4378	22 7F 43	LD (437F),HL	and save it
4388	21 30 43	LD HL, 4330	point to REPEAT
4391	21 85 43	LD HL, 4385	point to end +1
			change 85 to AA to save INIT.
4398	22 A4 40	LD (40A4),HL	

UTIL 2

Some instructions had the high byte 43 missing. The address of these instructions are:

4F55	4F5B	4F65	4FAC	4FB5	4FC0	4FC6
4FD2	4FD8	4FDB	4FE1	4FF3		

The 43 byte should be in the second address following the above addresses.

UTIL 3

42EA	21 A9 43	LD HL, 43A9	scroll on/off flag
4315	28 10	JR Z, 4327	READY
4325	18 08	JR, 432F	LWRCSE
4356	CD 8A 43	CALL 438A	FLASH
435F	32 A8 43	LD (43A8),A	
436A	F2 67 43	JP P, 4367	KLOOP
4370	2A A6 43	LD HL, (43A6)	
4382	3A A8 43	LD A, (43A8)	
4385	22 A6 43	LD (43A6), HL	
4388	2A A4 43	LD HL, (43A4)	
439A	21 90 01	LD HL, 0190	
439D	22 A4 43	LD (43A4), HL	
43B0	21 55 43	LD HL, 4355	
43B6	21 AA 43	LD HL, 43AA	change AA to CF to save INIT.

UTIL 4

High byte 4F missing from the following instructions -

4F30	4F36	4F40	4FAC	4F85	4FC0
4FC6	4FD2	4FD8	4FDB	4FE1	4FF3

The flashing cursor may leave unwanted characters on the screen during graphic displays. This may be eliminated by turning the cursor off.

Util	Address
1	17267
2	20462 32750 4K & 16K respectively
3	17304
4	20462 32750 4K & 16K respectively

To turn cursor OFF poke 0 into the address.
To turn it back on poke 208 into the address.

Any value may be POKEd in to turn the cursor back on and this will give a different character.

- 0000000000 -

***** INPUT/OUTPUT *****

From David Harris, 470 Marion Road, Plympton Park, South Australia 5038

I am interested in developing the use of my TRS-80 for computer-aided design (C.A.D). I am an engineer and have already developed some programs on the fringe of C.A.D. but am looking to take it further. I would like to contact anyone interested in this type of application and request that any interested reader contact me on 'phone number (08) 297 8207 during office hours.

(It sounds an interesting and challenging application, David. Would any interested readers please contact David directly - Ed.)

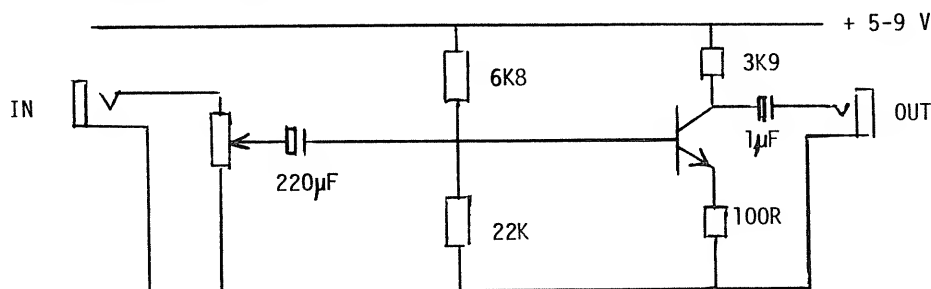
From: Mr. R. Hutson - London SE 12.

I would like to comment on the letter from B.N. Hall on page 11 of issue 19, where cassette waveform problems were described and a method of reproducing the correct waveform was included. This method required two comparators and two timers; these used the asymmetrical waveform to generate symmetrical pulses.

I believe that I have an answer to the problem using a simple single stage transistor circuit. I approached the problem by reproducing a pulse of similar shape and frequency from a pulse generator, from this I received a small positive response and a large negative response from my CTR41 cassette recorder. Upon further experimentation, I found that by sending the negative part of the pulse first (inversion), the waveform was reproduced perfectly, as the TRS-80 rectifies the audio input for processing, and inverting the pulse makes no difference.

Inversion was achieved by a single stage transistor circuit (audio amplifier), shown below with excellent results.

I have not investigated further as the problem had been solved, but I have had no dropouts since. I would be interested in a full explanation of why the recorder should prefer negative pulse before working. I would also be interested in a high speed cassette which I will start work on in the near future (approx. 4800 band).



(Thank you for this contribution Mr. Hutson. We have recently been carrying out an investigation into the cassette interface with a view to improving the quality of the cassettes we produce. We observed the phenomenon you describe but, as yet, have no explanation for it. It not only occurs in the relatively unsophisticated CTR41/CTR80/Video Genie cassette recorders but also in much more expensive cassette decks and high speed amplifiers. I suspect the real answer lies in the fact that we are dealing with a very non-linear system. Although the waveform of each pulse approaches a sinusoid after passing through the amplifier and being differentiated by the recording process, it should be remembered that each pulse is a single event and steady state theory does not apply - at least, not to the pulses as we see them on an oscilloscope. I seem to vaguely remember in my student days using Fourier Transformers to express signals such as these in steady-state terms. Perhaps one of our readers who is more au fait with these matters could offer an explanation (but please do not make it too mathematical). On the other hand, there may be a simple explanation - we would love to hear it. Concerning the high speed cassette interface you mention - one at least has already been developed in the U.S.A. It is called the "Poor Man's Floppy" model TC-8. It is available from JPC PRODUCTS CO. 12021 Paisano Ct. Albuquerque, New Mexico 87112 and operates at 2500 band. It sells in kit form for US\$90 and assembled for US\$120. We understand that in Australia De Forest Software, Station Street, Nunawading, Vic., also has these units available - Ed.)

From: Murray J. Dixon - Ringwood Victoria.

I would like to comment further on the letter from your UK correspondent (November 1980) regarding educational uses of the '80. Many people might be surprised to find the extent to which micro-computers are being used in secondary schools throughout Australia (our own small region has approximately 50 TRS-80 and System 80 computers in about half a dozen schools). This being the case, it is quite possible that a significant number of your readers are involved in computer education of some form. Could this readership be sufficiently large for you to consider including in each issue, a program which has a formal educational purpose as its main function.

Your comments regarding educational use of computers in schools in the UK are quite valid so, by pursuing such a course, perhaps you could assist we "beginners" in Australia by encouraging contributions from your more experienced UK subscribers.

(We would be only too happy to publish more educational programs and related material, Murray, if only it were forthcoming. Unfortunately, many of the "educational" programs submitted to us for consideration are no more than testing programs to ascertain how much a child knows. Whilst such programs have their place, there is a limit to the number of such programs which can be usefully published. It is strange, because we know that a significant factor for many people when deciding to purchase a computer is its educational value to their children. We will certainly be happy to publish as many good educational programs as possible and will also be happy to do our bit in helping to disseminate information about this field. In fact, we have some interesting articles on computers in education in the pipeline already. You might also note the '80 Users' Groups this month - some educationally oriented groups are now listed and I am sure they would welcome participation from any of our readers. - Ed.)

DON'T BE HELD BACK BY AN ANTIQUATED DISK OPERATING SYSTEM MOVE UP TO

NEWDOS 80 **\$149 incl. p&p**

NEWDOS 80 is a completely new DOS for the TRS-80 SYSTEM 80. It is well-documented, bug free and increases the power of your system many times over. It is upward compatible with TRSDOS AND NEWDOS (ie TRSDOS and NEWDOS+ programs will run on NEWDOS 80 but the reverse is not necessarily so).

These are just a few of the many new features offered by NEWDOS 80.

- * New BASIC commands that support variable record lengths up to 4095 bytes long.
- * Mix or match disk drives. Supports any track count from 18 to 96. Use 35, 40, 77 or 80 track 5¼ inch mini disk drives, 8 inch disk drives OR ANY COMBINATION.
- * An optional security boot-up for BASIC or machine code application programs. User never sees "DOS-READY" or "READY" and is unable to "BREAK", clear screen or issue any direct BASIC statements, including "LIST".
- * New editing commands that allow program lines to be deleted from one location and moved to another or to allow the duplication of a program line with the deletion of the original.
- * Enhanced and improved RENUMBER that allows relocation of subroutines.
- * Create powerful chain command files which will control the operation of your system.
- * Device handling for routing to display and printer simultaneously.
- * MINIDOS — striking the D, F and G keys simultaneously calls up a MINIDOS which allows you to perform many of the DOS commands without disturbing the resident program.
- * Includes Superzap 3.0 which enables you to display/print/modify any byte in memory or on disk.
- * Also includes the following utilities:
 - Disk Editor/Assembler
 - Disassembler (Z80 machine code)
 - LM offset — allows transfers of any system tape to Disk file — automatically relocated.
 - LEVEL 1 — Lets you convert your computer back to Level 1.
 - LVIDKSL — Saves and loads Level 1 programs to disk.
 - DIRCHECK — Tests disk directories for errors and lists them.
 - ASPOOL — An automatic spooler which routes a disk file to the printer whilst the computer continues to operate on other programs.
 - LCDVR — a lower case drives which display lower case on the screen if you have fitted a simple lower case modification.

DISK DRIVE USERS ELIMINATE CRC ERRORS AND TRACK LOCKED OUT MESSAGES FIT A PERCOM DATA SEPARATOR \$37.00 plus \$1.20 p&p.

When Tandy designed the TRS-80 expansion interface, they did not include a data separator in the disk-controller circuitry, despite the I.C. manufacturer's recommendations to do so. The result is that many disk drive owners suffer a lot of Disk I/O errors. The answer is a data separator. This unit fits inside your expansion interface. It is supplied with full instructions and is a must for the serious disk user.

MPI DISK DRIVES HIGHER PERFORMANCE — LOWER PRICE

MPI is the second largest manufacturer of disk drives in the world. MPI drives use the same form of head control as 8" drives and consequently, they have the fastest track-to-track access time available — 5msec! All MPI drives are capable of single or double-density operation. Double-density operation requires the installation of a PERCOM doubler board in the expansion interface.

As well as single head drives, MPI also makes dual-head drives. A dual-head drive is almost as versatile as two single-head drives but is much cheaper.

Our MPI drives are supplied bare or in a metal cabinet — set up to operate with your TRS-80 or SYSTEM 80. All drives are sold with a 90 day warranty and service is available through MICRO-80 PRODUCTS.

MPI B51 40 Track Single Head Drive.only \$349
MPI B52 40 Track Double Head Drive.only \$449

Prices are for bare drives and include p&p. Add \$10.00 per drive for a cabinet and \$60.00 for a power supply to suit two drives. 40 track drives are entirely compatible with 35 track drives. A 40 track DOS such as NEWDOS 80 is necessary to utilise the extra 5 tracks.

OVER 800 KILOBYTES ON ONE DISKETTE! WITH MPI 80 TRACK DRIVES

MPI 80 track drives are now available. The B91 80 track single-head drive stores 204 Kilobytes of formatted data on one side of a 5¼ inch diskette in single-density mode. In double-density mode it stores 408 Kilobytes and loads/saves data twice as quickly.

The B92 80 track dual-head drive stores 204 Kilobytes of formatted data on EACH side of a 5¼ inch diskette in single-density mode. That's 408 Kilobytes per diskette. In double-density mode, the B92 stores a mammoth 408 Kilobytes per side or 816 Kilobytes of formatted data per diskette. With two B92's and a PERCOM double, you could have over 1.6 Megabytes of on line storage for your TRS-80 for less than \$1500!!

MPI B91 80 Track Single Head Drive.only \$499
MPI B92 80 Track Dual Head Driveonly \$619

Prices are for bare drives and include p&p. Add \$10.00 per drive for a cabinet and \$60.00 for a power supply to suit two drives. Note: 80 track drives will not read diskettes written on a 35 or 40 track drive. If drives with different track counts are to be operated on the same system, NEWDOS 80 must be used.

CARE FOR YOUR DISK DRIVES? THEN USE 3M's DISK DRIVE HEAD CLEANING DISKETTES \$30.20 incl. p&p.

Disk drives are expensive and so are diskettes. As with any magnetic recording device, a disk drive works better and lasts longer if the head is cleaned regularly. In the past, the problem has been, how do you clean the head without pulling the mechanism apart and running the risk of damaging delicate parts. 3M's have come to our rescue with SCOTCH BRAND, non-abrasive, head cleaning diskettes which thoroughly clean the head in seconds. The cleaning action is less abrasive than an ordinary diskette and no residue is left behind. Each kit contains:

- 2 head cleaning diskettes
- 1 bottle of cleaning fluid
- 1 bottle dispenser cap

USE TANDY PERIPHERALS ON YOUR SYSTEM-80 VIA

SYSPAND-80 - \$97.50 incl. p&p

The SYSTEM-80 hardware is not compatible with the TRS-80 in two important areas. The printer port is addressed differently and the expansion bus is entirely different. This means that SYSTEM-80 owners are denied the wealth of economical, high performance peripherals which have been developed for the TRS-80. Until now, that is. MICRO-80 has developed the SYSPAND-80 adaptor to overcome this problem. A completely self-contained unit in a small cabinet which matches the colour scheme of your computer, it connects to the 50-way expansion part on the rear of your SYSTEM 80 and generates the FULL Tandy 40 way bus as well as providing a Centronics parallel printer port. SYSPAND-80 enables you to run an Exatron Stringy Floppy from your SYSTEM 80, or an LNW Research expansion interface or any other desirable peripherals designed to interface to the TRS-80 expansion port. Make your SYSTEM 80 hardware compatible with the TRS-80 via SYSPAND-80.

PROGRAMS BY MICROSOFT

EDITOR ASSEMBLER PLUS (L2/16K)

\$37.50 + \$1.20 p&p

A much improved editor-assembler and debug/monitor for L2/16K TRS-80 or SYSTEM 80. Assembles directly into memory, supports macros and conditional assembly, includes new commands-substitute, move, copy and extend.

LEVEL III BASIC

\$59.95 plus \$1.20 p&p

Loads on top of Level II BASIC and gives advanced graphics, automatic renumbering, single stroke instructions (shift-key entries) keyboard debounce, suitable for L2/16K and up (Not Disk BASIC)

ADVENTURE ON DISK

\$35.95 plus \$1.20 p&p

This is the original ADVENTURE game adapted for the TRS-80. The game fills an entire diskette. Endless variety and challenge as you seek to rise to the level of Grand Master. Until you gain skill, there are whole areas of the cave that you cannot enter. (Requires 32K One Disk)

BASIC COMPILER

\$208 plus \$2.00 p&p

New improved version, the Basic Compiler converts Disk BASIC programs to machine code, automatically. A compiled program runs, on average, 3-10 times faster than the original BASIC program and is much more difficult to pirate.

UPGRADE TO 16K FOR ONLY \$30.00!!

MICRO-80's 16K MEMORY EXPANSION KIT HAS BEEN REDUCED IN PRICE EVEN MORE

Larger volume means we buy better and we pass the savings on to you. These are our proven, prime, branded 200 ns (yes, 200 nanosecond) chips. You will pay much more elsewhere for slow, 350 ns. chips. Ours are guaranteed for 12 months. A pair of DIP shunts is also required to upgrade the CPU memory in the TRS-80 — these cost an additional \$4.00. All kits come complete with full, step-by-step instructions which include labelled photographs. No soldering is required. You do not have to be an experienced electronic technician to instal them.

DISK DRIVE CABLES SUITABLE FOR ANY DISK DRIVES

DC-2 2 Drive Connector Cable \$39 incl. p&p
DC-4 4 Drive Connector Cable \$49 incl. p&p

DOUBLE THE SPEED AND CAPACITY OF YOUR DISK DRIVES PERCOM DOUBLER ONLY \$220

plus \$2.00 p&p

Installing a Doubler is like buying another set of disk drives, only much cheaper!! The doubler works with most modern disk drives including:- MPI, Micropolis, Pertec, TEAC (as supplied by Tandy). The doubler installs in the TRS-80 expansion interface, the System-80 expansion interface and the LNW Research expansion interface in a few minutes without any soldering, cutting of tracks, etc. It comes complete with its own TRSDOS compatible double density operating system.

DOUBLE-ZAP II — DOUBLE DENSITY PATCH FOR NEWDOS 80

ONLY \$53.00 plus \$1.00 p&p

If you are using NEWDOS 80, then you also need DOUBLE-ZAP II on diskette. This program upgrades your NEWDOS 80 to double density with ADR (automatic density recognition). It retains all the familiar features, including the ability to mix and match track counts on the same cable. In addition, it gives NEWDOS 80 the ability to mix densities on the same cable, automatically. If you place a single density diskette in drive 0, say and a double density diskette in drive 1, Double-ZapII will recognise this and read/write to drive 0 in single density whilst at the same time it reads/writes to drive 1 in double density!

FLOPPY DOCTOR AND MEMORY DIAGNOSTIC (by MICRO CLINIC) \$29.95 plus 50c. p&p

Two machine language programs on a diskette together with manual which thoroughly test your disk drives and memory. There are 19 possible error messages in the disk drive test and their likely causes are explained in the manual. Each pass of the memory tests checks every address in RAM 520 times, including the space normally occupied by the diagnostic program itself. When an error occurs the address, expected data, and actual data are printed out together with a detailed error analysis showing the failing bit or bits, the corresponding IC's and their location. This is the most thorough test routine available for TRS-80 disk users.

BOOKS

LEVEL II ROM REFERENCE MANUAL

\$24.95 + \$1.20 p&p

Over 70 pages packed full of useful information and sample programs. Applies to both TRS-80 and SYSTEM 80.

TRS-80 DISK AND OTHER MYSTERIES

\$24.95 + \$1.20 p&p

The hottest selling TRS-80 book in the U.S.A. Disk file structures revealed, DOS's compared and explained, how to recover lost files, how to rebuild crashed directories — this is a must for the serious Disk user and is a perfect companion to any of the NEWDOS's.

LEARNING LEVEL II

\$16.95 + \$1.20 p&p

Written by Daniel Lien, the author of the TRS-80 Level I Handbook, this book teaches you, step-by-step, how to get the most from your Level II machine. Invaluable supplement to either the TRS-80 Level II Manual or the System-80 Manuals.

MORE AUSTRALIAN SOFTWARE

All programs designed to run on both the TRS-80 or the SYSTEM 80 without modification. Most programs include sound

TRIAD VOL 1 – L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Three separate games which test your powers of memory and concentration. The programs combine graphic displays and sound:

SIMON-SEZ: Just like the electronic music puzzles on sale for more than \$20. Numbers are flashed on the screen and sounded in a sequence determined by the computer. Your task is to reproduce the sequence, correctly.

LINE?: Rather like a super, complicated version of noughts and crosses. You may play against another player or against the computer itself. But beware, the computer cheats!

SUPER CONCENTRATION: Just like the card game but with more options. You must find the hidden pairs. You may play against other people, play against the computer, play on your own, or even let the '80 play on its own.

TRIAD VOL 2 – L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Remember those "NUMERO" puzzles in which you had a matrix of numbers (or letters) with one blank space and you had to shuffle the numbers around one at a time until you had made a particular pattern? Well, **SHUFFLEBOARD**, the first program in this triad, is just this, except that the computer counts the number of moves you take to match the pattern it has generated – so it is not possible to cheat.

MIMIC is just like **SHUFFLEBOARD** except that you only see the computer's pattern for a brief span at the beginning of the game, then you must remember it!

In **MATCHEM**, you have to manoeuvre 20 pegs from the centre of the screen to their respective holes in the top or bottom rows. Your score is determined by the time taken to select a peg, the route taken from the centre of the screen to the hole and your ability to direct the peg into the hole without hitting any other peg or the boundary.

VISURAMA L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Two programs which give fascinating, ever-changing patterns on the screen.

LIFE is the fastest implementation of the Game of Life you will see on your '80. Machine language routines create up to 1200 new generations per minute for small patterns or up to 100 per minute for the full 128 x 48 screen matrix. Features full horizontal and vertical wraparound.

EPICYCLES will fascinate you for hours. The ever-changing ever-moving patterns give a 3D effect and were inspired by the ancient Greek theories of Ptolemy and his model of the Solar system.

EDUCATION AND FUN – L1/4K, L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Written by a primary school teacher to make learning enjoyable for his pupils, there are five programs in both Level I and Level II to suit all systems:

BUG-A-LUG: a mathematics game, in which you must get the sum correct before you can move.

AUSTRALIAN GEOGRAPHY: learn about Australian States and towns, etc.

SUBTRACTION GAME: build a tower with correct answers.

HOW GOOD IS YOUR MATHS? Select the function (+, -, ÷ or X) and degree of difficulty.

HANGMAN: That well known word game now on your computer.

Recommended for children from 6 to 9 years.

COSMIC FIGHTER & SPACE JUNK – L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Both programs have sound to complement their excellent graphics. In **COSMIC FIGHTER**, you must defend the earth against seven different types of alien aircraft. It is unlikely that you will be successful but you will have a lot of fun trying!

Your mission in **SPACE JUNK** is to clean up all the debris left floating around in space by those other space games. It is not as simple as it sounds and space junk can be quite dangerous unless you are very careful.

SPACE DRIVE L2/4K & 16K

Cassette \$8.95 Disk \$13.95

+ 60c p&p

Try to manoeuvre your space ship through the meteor storms then land it carefully at the space port without running out of fuel or crashing. Complete with realistic graphics.

STARFIRE AND NOVA INVASION L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

Both programs include sound to improve their realism.

STARFIRE seats you in the cockpit of an X-wing fighter as you engage in battle with the deadly Darth Vader's Tie-fighters. Beware of the evil one himself and may the Force be with you.

In **NOVA INVASION**, you must protect your home planet of Hiberna from the invading NOVADIANS. You have two fixed guns at each side of the screen and a moveable one at the bottom. Apart from shooting down as many invaders as possible, you must protect your precious hoard of Vitaminium or perish!

AIR ATTACK AND NAG RACE – L2/16K

Cassette \$10.95 Disk \$15.95

+ 60c p&p

An unlikely combination of programs but they share the same author who has a keen sense of humour.

AIR ATTACK includes sound and realistic graphics. The aircraft even have rotating propellers! But they also drop bombs on you, so it's kill or be killed!

NAG RACE lets you pander to your gambling instinct without actually losing real money. Up to five punters can join in the fun. Each race results in a photo-finish whilst there is a visible race commentary at the bottom of the screen throughout the race. Happy punting!

FOUR LETTER MASTERMIND L2/16K

Cassette \$8.95 Disk \$13.95

+ 60c p&p

There are 550 four-letter words from which the computer can make its choice. You have 12 chances to enter the correct word. After each try, the computer informs you of the number of correct letters and those in the correct position. You can peek at the list of possible words but it will cost you points. Makes learning to spell fun.

MUSIC IV – L2/16K

Cassette \$8.95 Disk \$13.95

+ 60c p&p

Music IV is a music compiler for your '80. It allows you to compose or reproduce music with your computer that will surprise you with its range and quality. You have control over duration (full beat to 1/16 beat) with modifications to extend the duration by half or one third for triplets. Both sharps and flats are catered for as are rests. Notes on whole sections may be repeated. The program comes with sample data for a well-known tune to illustrate how it is done.

*** SAVE 00's *** SAVE 00's *** SAVE 00's *** MICRO-80 EXPANSION INTERFACE ***

MICRO-80's expansion interface utilises the proven LNW Research Expansion board. It is supplied fully built up and tested in an attractive cabinet with a self contained power supply, ready to plug in and go. The expansion interface carries MICRO-80's full, no hassle, 90-day warranty.

Features include:- ● Sockets for up to 32K of memory expansion ● Disk controller for up to 4 disk drives ● Parallel printer port ● Serial RS232C/20mA I/O port ● Second cassette (optional)

The expansion interface connects directly to your TRS-80 L2/16K keyboard or, via SYSPAND-80 to your SYSTEM-80/VIDEO GENIE Prices: HD-010-A Expansion Interfaces with Ø K : \$499.00 HD-010-B Expansion Interfaces with 32K : \$549.00 HD-011 Data separator fitted (recommended) : add \$29.00 HD-012 Dual cassette Interfaces fitted : add \$19.00

The MICRO-80 Expansion Interface is also available in kit form.

Prices: HD-013 Kit consisting of LNW Research PC board and manual, ALL components including cabinet & power supply : \$375.00 HD-011 Data separator for above \$25.00 HD-013 Dual cassette Interface kit : \$15.00

**TURN
THIS**

**into
this**

for \$49.00 plus \$2.00 p & p

A choice of upper and lower case display is easier to read, gives greater versatility.

The Micro-80 lower case modification gives you this facility, plus the symbols for the 4 playing-card suits for \$49.00 + \$2.00 p. & p.

The Micro-80 modification features true below-the-line descenders and a block cursor.

Each kit comes with comprehensive fitting instructions and two universal lower-case drive routines on cassette to enable you to display lower case in BASIC programs.

The driver routines are self-relocating, self-protecting and will co-reside with other machine language programs such as Keyboard-debounce, serial interface driver programs etc.

Both programs give your TRS-80™ Model I or System 80™ an optional typewriter capability, i.e. shift for upper case

The second programme also includes Keyboard-debounce and a flashing cursor.

You fit it. Or we can.

Fitting the modification requires soldering inside the computer. This should only be carried out by an experienced hobbyist or technician.

If you are at all dubious, a fitting service is available in all capital cities for only \$20.00.

A list of installers is included with each kit

Save \$120 now.

**ADD A DISK DRIVE TO YOUR TRS-80™ MODEL III
FOR ONLY \$875.00 OR ADD TWO FOR ONLY \$1199.**



The Micro-80 disk drive upgrade for the TRS-80™ Model III contains the following high quality components:

1 or 2 MPI 40-track single head disk drives, 1 VR Data double-density disk controller board and 1 dual drive power supply plus all the necessary mounting hardware, cables and comprehensive fitting instructions, which can be carried out with a minimum of fuss by any average computer owner.

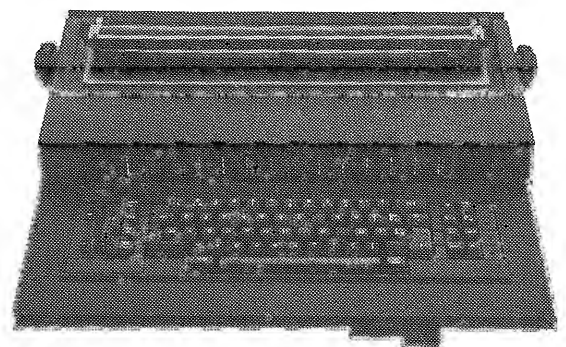
Fitting service is available for \$25.00 in most capital cities.

ONLY \$2049 INC. S.T.

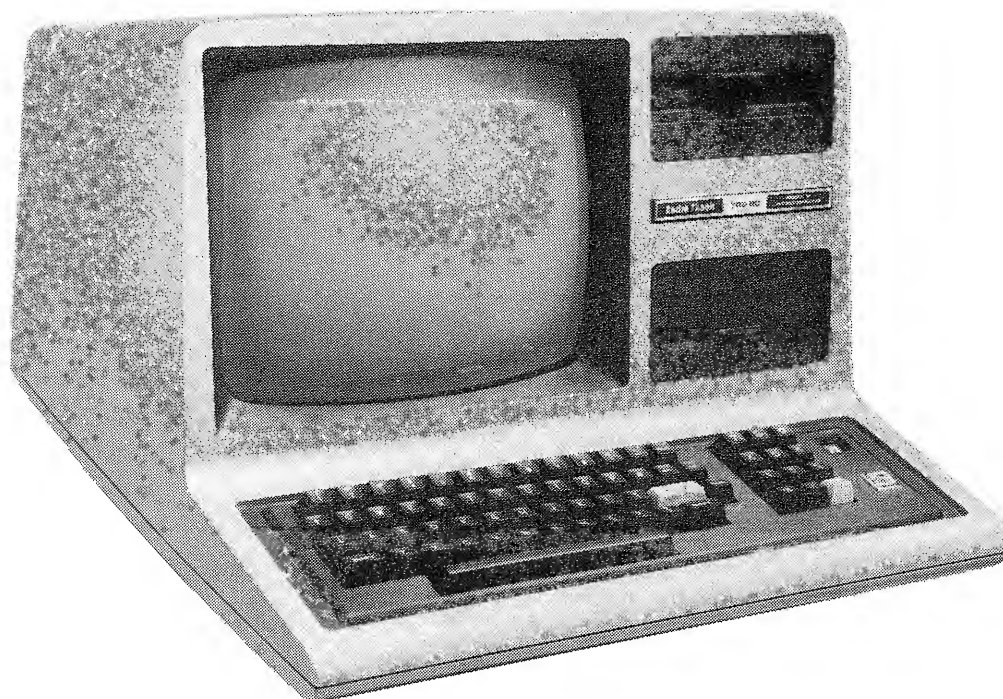
Daisy Wheel Typewriter/Printer

MICRO-80 has converted the new OLIVETTI ET-121 DAISY WHEEL typewriter to work with the TRS-80 and SYSTEM 80 or any other microcomputer with a Centronics parallel port (RS 232 serial interface available shortly). The ET-121 typewriter is renowned for its high quality, fast speed (17 c.p.s.), quietness and reliability. MICRO-80 is renowned for its knowledge of the TRS-80/SYSTEM 80 and its sensible pricing policy. Together, we have produced a dual-purpose machine:- an attractive, modern, correcting typewriter which doubles as a correspondence quality Daisy-wheel printer when used with your micro-computer.

How good is it? - This part of our advertisement was typeset using an ET-121 driven by a TRS-80. Write and ask for full details.



1.4 MEGABYTES ON LINE + 48K RAM **for \$3800** incl. Sales Tax



MICRO-80's **MODEL 380 +**

MICRO-80 has equipped the TRS-80 with two high reliability dual-head 80 track mini-floppy disk drives made by MPI, one of America's leading mini-disk drive manufacturers.

This turns the mild-mannered Model 3 into a powerhouse able to handle the most difficult business programs. The TRS-80 is one of the best-supported microcomputers in the world. MICRO-80 has been supporting the TRS-80 in Australia for 18 months and is one of Australia's leading dealers in MPI disk drives.

2.8 MEGABYTES FOR \$5300 incl. Sales Tax

If you need even more file space you can add MICRO-80's external dual-drive cabinet enclosing two more dual-head 80 track drives for an additional \$1500.

COMPUTER PRICES

MODEL 340

2 40 TRACK SINGLE HEAD DRIVES GIVING
350K FORMATTED STORAGE, 48K RAM

\$2990 INCL. SALES TAX

MODEL 340 +

2 40 TRACK DUAL-HEAD DRIVES GIVING
700K FORMATTED STORAGE, 48K RAM

\$3350 INCL. SALES TAX

MODEL 380

2 80 TRACK SINGLE HEAD DRIVES GIVING
700K FORMATTED STORAGE, 48K RAM

\$3350 INCL. SALES TAX

MODEL 380 +

2 80 TRACK DUAL-HEAD DRIVES GIVING
1.4 MEGABYTE FORMATTED STORAGE, 48K RAM

\$3800 INCL. SALES TAX

350K SYSTEM

MODEL 340, EPSON MX-80 PRINTER
NEWDOS 80 DISK OPERATING SYSTEM

\$4070 INCL. SALES TAX

700K SYSTEM (40 Track)

MODEL 340 +, EPSON MX-80 PRINTER
NEWDOS 80 DISK OPERATING SYSTEM

\$4429 INCL. SALES TAX

700K SYSTEM (80 Track)

MODEL 380, EPSON MX-80 PRINTER
NEWDOS 80 DISK OPERATING SYSTEM

\$4429 INCL. SALES TAX

1.4 MEGABYTE SYSTEM

MODEL 380 +, EPSON MX-80 PRINTER
NEWDOS 80 OPERATING SYSTEM

\$4880 INCL. SALES TAX

2.8 MEGABYTE SYSTEM

MODEL 380 +, DUAL EXTERNAL DRIVES,
MX-80 PRINTER, NEWDOS 80 OPERATING SYSTEM

\$6380 INCL. SALES TAX



EXATRON STRINGY FLOPPY — \$372.50 Incl. P&P

All Exatron Stringy Floppies sold by MICRO-80 include the special chained version of **HOUSEHOLD ACCOUNTS**, developed by Charlie Bartlett. When used on the ESF, this program is powerful enough to perform many of the accounting functions in a small business. Remember, the ESF comes complete with a comprehensive manual, a 2 way bus-extender cable, its own power supply and 10 wafers of mixed length. One wafer contains the Data Input/Output program and another the **HOUSEHOLD ACCOUNTS** program.

CAN'T MAKE UP YOUR MIND ABOUT THE ESF?

Then send in \$5.00 for a copy of the manual. We will refund your \$5.00 IN FULL when you purchase an ESF.



All prices subject to change without notice. Prices are F.O.B. Adelaide. All computers and systems carry MICRO-80's 90-day Warranty covering parts and labour.

SOFTWARE BY AUSTRALIAN AUTHORS

All our software is suitable for either the SYSTEM 80 or the TRS-80

NEW SOFTWARE FROM MICRO-80 PRODUCTS BUSINESS PROGRAMS

MICROMANAGEMENT STOCK RECORDING SYSTEM (L2/16K)

Cassette version. \$29.95 + \$1.00 p&p
Stringy Floppy version. \$33.95 + \$1.00 p&p

This system has been in use for 9 months in a number of small retail businesses in Adelaide. It is therefore thoroughly debugged and has been tailor made to suit the requirements of a small business. MICROMANAGEMENT SRC enables you to monitor the current stock level and reorder levels of 500 different stock items per tape or wafer. It includes the following features:—

- Add new items to inventory
- Delete discontinued items from inventory
- List complete file
- Search for any stock number
- Save data to cassette or wafer
- Load data from cassette or wafer
- Adjusts stock levels from sales results and receipt of goods
- List all items requiring reordering

We can thoroughly recommend this program for the small business with a L2/16K computer.

SCOTCH BRAND COMPUTING CASSETTES

Super-quality personal computing cassettes.

C-10 pack of 10 \$26.00 incl. p&p
C-30 pack of 10 \$28.00 incl. p&p

UTILITIES

S-KEY by Edwin Paay \$15.95 plus 50c. p&p

S-KEY is a complete keyboard driver routine for the TRS-80 and becomes part of the Level II basic interpreter. With S-KEY loaded the user will have many new features not available with the standard machine.

S-KEY features:

- * S-KEY provides an auto-repeat for all the keys on the keyboard. If any key is held down longer than about half a second, the key will repeat until it is released.
- * Graphic symbols can be typed direct from the keyboard, this includes all 64 graphic symbols available from the TRS-80/SYSTEM 80.
- * S-KEY allows text, BASIC commands and/or graphics to be defined to shifted keys. This makes programming much easier as whole commands and statements can be recalled by typing shift and a letter key.
- * Because S-KEY allows graphics to be typed directly from the keyboard, animation and fast graphics are easily implemented by typing the appropriate graphics symbols directly into PRINT statements.
- * S-KEY allows the user to LIST a program with PRINT statements containing graphics, properly. S-KEY does this by intercepting the LIST routine when necessary.
- * S-KEY allows the user to list an updated list of the shift key entries to the video display or line printer.
- * S-KEY can be disabled and enabled when required. This allows other routines which take control of the keyboard to run with S-KEY as well.

Each cassette has TRS-80, DISK and SYSTEM 80 versions and comes with comprehensive documentation.

BMON by Edwin Paay \$19.95 plus 50c. p&p
THE ULTIMATE HIGH MEMORY BASIC MONITOR L2/16-48K

Our own personnel refuse to write BASIC without first loading this amazing machine language utility program into high memory! BMON Renumbers; Displays BASIC programs on the screen while they are still loading; tells you the memory locations of the program just loaded; lets you stop a load part-way through; merges two programs, with automatic renumbering of the second so as to prevent any clashes of line numbers; recovers your program even though you did type NEW; makes one program invisible while you work on a second (saves hours of cassette time!); lists all the variables used in the program; makes SYSTEM tapes; lets you Edit memory directly . . . the list goes on and on. Cassette comes with 16K, 32K and 48K versions, ready to load. Can anyone afford NOT to have BMON?

EDUCATIONAL

RPN CALCULATOR (L2/16K & 32K)
\$14.95 \$ 50c. p&p

Give your computer the power of a \$650 reverse polish notation calculator with 45 functions and selectable accuracy of 8 or 16 digits. The main stack and registers are continuously displayed whilst the menu is always instantly accessible without disturbing any calculations or register values. The cassette comes with both the 16K and 32K versions, the latter giving you the additional power of a programmable calculator. Comes with a very comprehensive 15 page manual, which includes instructions to load and modify the 32K programmable version to run in 16K. Whether for business or pleasure, this package will prove invaluable, and turn you '80 into a very powerful instrument.

GAMES

MICROPOLY (L2/16K) \$8.95 + 60c p&p

Now you can play Monopoly on your micro. The old favourite board game has moved into the electronic era. This computer version displays the board on the screen, obeys all the rules and, best of all, the banker does not make mistakes with your change!

CONCENTRATION (L2/16K) \$8.95 + 60c p&p

Another application of supergraphics. There are 28 "cards" displayed on the screen, face down. Players take it in turn to turn them over with the object of finding matching pairs. There are 40 different patterns which are chosen at random, so the game is full of endless variety. This is of particular value in helping young children to learn the art of concentrating and, at the same time, to introduce them to the computer.

METEOR AND TORPEDO ALLEY (L2/16K)

\$10.95 + 60c p&p

Those who frequent games arcades will recognize these two electronic games. In METEOR you must destroy the enemy space ships before they see you. In its most difficult mode, the odds are a thumping 238 to 1 against you being successful. In torpedo alley you must sink the enemy ships without hitting your own supply ship. Both games include sound effects and are remarkably accurate reproductions of the arcade games.

AUSTRALIAN SOFTWARE (Cont.)**GAMES****SHEEPDOG (L2/16K)****\$8.95 + 60c p&p**

Ever wondered how a sheepdog manages to drive all those awkward sheep into a pen? Well, here is your chance to find out just how difficult it is and have a lot of fun at the same time. You control the sheepdog, the computer controls the sheep! As if that isn't enough, look out for the dingoes lurking in the bush!

U BOAT**\$8.95 + 60c p&p**

Real time simulation at its best! Comes with working sonar-screen and periscope, a full rack of torpedoes, plenty of targets, working fuel and battery meters, helpful Mothership for high-seas reprovisioning and even has emergency radio for that terrible moment when the depth charges put your crew at risk. Requires Level II/16K.

SPACE INVADERS WITH SOUND**\$8.95 + 60c p&p**

Much improved version of this arcade favourite with redesigned laser and cannon blasts, high-speed cannon, 50 roving drone targets, 10 motherships and heaps of fun for all. Level II with 4K and 16K versions on this cassette.

GOLF (L2/16K)**\$8.95 + 60c p&p**

Pit your skills of mini-golf against the computer. Choose the level of difficulty, the number of holes and whether you want to play straight mini golf or crazy golf. Complete with hazards, water traps, bunkers and trees. Great fun for kids of all ages.

DOMINOES (L2/16K)**\$8.95 + 60c p&p**

Pit your skill at dominoes against the computer, which provides a tireless opponent. Another application of supergraphics from the stable of Charlie Bartlett. Dominoes are shown approximately life size in full detail (except for colour!). The monitor screen is a window which you can move from one end of the string of dominoes to the other. Best of all, you don't lose any pieces between games!

KID'S STUFF (formerly MMM-1)**\$8.95 + 60c p&p**

Three games on one cassette from that master of TRS-80 graphics, Charlie Bartlett. Includes INDY 500, an exciting road race that gets faster and faster the longer you play, SUBHUNT in which your warship blows up unfortunate little submarines all over the place, and KNIEVEL (as in motorcycle, ramp and buses).

OTHER PROGRAMS**INFINITE BASIC BY RACET (32K/1 DISK)****\$49.95 + 50c. p&p**

Full matrix functions — 30 BASIC commands; 50 more STRING functions as BASIC commands.

GSF/L2/48K**\$24.95 + 50c. p&p**

18 machine language routines including RACET sorts.

BUSINESS ADDRESS AND INFORMATION SYSTEM (48K/DISK)**\$24.95 + 50c. p&p**

Allows you to store addresses and information about businesses, edit them and print them out.

HISPED (L2 16, 32 or 48K) \$29.95

This machine language program allows you to SAVE and LOAD programs and data to tape at speeds up to 2000 baud (4 times normal) using a standard cassette recorder. A switch must be installed to remove the XR3 III loading board, if fitted.

LOWER CASE FOR YOUR TRS-80/SYSTEM 80**Kit only \$49.00 plus \$2.00 p&p**

Give your TRS-80 or SYSTEM 80 a lower case display with proper descenders and a block cursor (similar to the TRS-80 Model III). Also includes symbols for the four suits of cards. Includes full fitting instructions, all necessary components and a special machine language driver program to enable lower case in BASIC. The modification is similar to the Tandy model and does not work with Electric Pencil without further modifications.

These kits require disassembly of your computer and some soldering. They should only be installed by someone who has experience in soldering integrated circuits, using a low power, properly earthed soldering iron. If you do not have the necessary experience/equipment, we will install the modification for you for \$20 plus freight in both directions. Make sure you arrange the installation with us first, before despatching your computer, so that we can assure you of a rapid turn-around. We are also arranging to have installers in each State. See elsewhere in this issue for their names and addresses.

PRICES

Cat No.

HD-020 Lower case mod kit for TRS-80

\$49.00 plus \$2.00 p&p

HD-021 Lower case mod kit for SYSTEM-80

\$49.00 plus \$2.00 p&p**EPSON MX-80 PRINTER****ONLY \$949 Inc. Cable for TRS-80 and p&p****(*Printer only — \$940 incl. p&p)**

The EPSON MX-80 printer is compact, quiet, has features unheard of only 2-3 years ago in a printer at any price and, above all, is ultra-reliable. All available print modes may be selected under software control. Features include:

- high quality 9x9 dot-matrix character formation
- 3 character densities
 - . 80 characters per line at 10 chars/inch
 - . 132 characters per line at 16.5 chars/inch
 - . 40 characters per line at 5 chars/inch
- 2 line spacings
 - . 6 lines per inch 8 lines per inch
- 80 characters per second print speed
- bi-directional printing
- logical seeking of shortest path for printing
- lower case with descenders
- TRS-80 graphics characters built in
- standard Centronics printer port

The bi-directional printing coupled with the logical seeking of the shortest print path (which means that the print head will commence printing the next line from the end which requires the least travel, thereby minimising unutilised time) gives this printer a much higher throughput rate than many other printers quoting print speeds of 120 c.p.s. or even higher.

GREEN SCREEN SIMULATOR**\$9.50 incl. p&p**

The GREEN SCREEN SIMULATOR is made from a deep green perspex, cut to fit your monitor. It improves contrast and is much more restful to the eyes than the normal grey and white image.

All editorial staff of MICRO-80 are now using GREEN SCREEN SIMULATORS on their own monitors.

Please make sure to specify whether you have an old (squarish) or new (rounded) style monitor when ordering. Not available for Dick Smith monitors.

***** PUT m/l 4-16K

by S. Barnett *****

This is a m/l program to SET nongraphic characters. You will need either a monitor program such as TBUG or BMON (MICRO-80 issues 3, 4 and 5) or an editor/assembler. If using a monitor, start editing memory at the address shown at the top of the left hand column and change each memory address to the value shown in the next column. E.g. change 7FB8 to , to , to , to , to and so on. Note that this program resides in the same area as BMON. If you wish to use BMON to enter it, then you must either use the 32K or 48K version (assuming your computer has sufficient capacity) or you must offset the program to start at 5FB8H (say) and append a short block move routine as described in MICRO-80 issue 10 to shift it to its correct position when run. Using the Editor/Assembler, you may easily relocate the program for different size machines simply by changing the ORG address. Use 4FB8 for 4K, BFB8 for 32K and FFB8 for 48K machines.

Use the editor/assembler or monitor to punch out a SYSTEM tape having the following parameters:

START	END	ENTRY	NAME
7FB8			PUT

Note, if you have appended a block move routine, the START, END and ENTRY addresses will differ from those shown above.

To load the program from tape type:-

SYSTEM and press the ENTER/NEWLINE key. Then in response to the next prompt type:-

PUT and press the ENTER/NEWLINE key. When the program has loaded type / and press the ENTER/NEWLINE key. PUT is now active.

Although this program was not designed to RUN on a disk system it will do so without any modification. Of course, once the program has been loaded, disk users should be aware that the normal function of the PUT command will now not be available until the system is reBOOTed.

To load the program from disk, if you have NEWDOS 80, type:-

BASIC press ENTER/NEWLINE
CMD"PUT" press ENTER/NEWLINE

For any other DOS:-

From DOS type LOAD PUT/CMD and press ENTER/NEWLINE
Type BASIC and press ENTER/NEWLINE
Type SYSTEM and press ENTER/NEWLINE
Type /32696 and press ENTER/NEWLINE

DO NOT attempt to start the program from DOS or your system will hang.

You may NOW PUT non graphics on the screen in a similar fashion to the SET command.
The format of the command can be either of the following:-

PUT(X,Y), "stringname" or PUT(X,Y),variable

X can be any value between 0 and 63 corresponding to its position across the screen and Y can be any value between 0 and 15 corresponding to its position down the screen.

For example, PUT(20,15),"*" will SET an asterisk on the screen 20 columns across and 15 lines down; the same thing may be done this way:-

```
10 CLS
20 A$="*"
30 PUT(20,15),A$
```

The normal SN ERROR will be given if the command is not typed in correctly or an FC ERROR will be given if you specify values for X or Y that exceed the stated range.

	00001 ;	(C) S. BARNETT
	00002 ;	PUT COMMAND TO SET NON GRAPHICS
7FB8	00003	ORG 7FB8H
7FB8 21C67F	00004 START	LD HL,60 ;INSTALL
7FB8 228341	00005	LD (4183H),HL ;PUT
7FBE 3EC3	00006	LD A,0C3H ;COMMAND
7FC0 328241	00007	LD (4182H),A
7FC3 C3CC06	00008	JP 6CCH ;RETURN TO BASIC
7FC6 CF	00009 GO	RST 08H ;SN ERROR IF NOT "("
7FC7 28	00010	DEFB 28H
7FC8 CD1C2B	00011	CALL 2B1CH ;EVALUATE X PARAMETER
7FCB FE40	00012	CP 64 ;IS IT GREATER THAN OR
7FCD D24A1E	00013	JP NC,1E4AH ;EQUAL TO 64. IF YES FC ERROR
7FD0 F5	00014	PUSH AF ;SAVE X PARAMETER
7FD1 CF	00015	RST 08H ;SN ERROR IF NOT ", "

7FD2 2C	00016	DEFB	2CH	
7FD3 CD1C2B	00017	CALL	2B1CH	;EVALUATE Y PARAMETER
7FD6 FE10	00018	CP	16	;FC ERROR IF Y VALUE IS
7FD8 D24A1E	00019	JF	NC,1E4AH	;GREATER OR EQUAL TO 16
7FDB 22FD7F	00020	LD	(TMPS),HL	;SAVE COMMAND POINTER
7FDE 3C	00021 XX1	INC	A	;MAKE SURE Y PARAMETER IS
	00022 ;			AT LEAST 1
7FDF 47	00023	LD	B,A	;LOAD IN B FOR LOOP
7FE0 210000	00024	LD	HL,00	;CLEAR HL
7FE3 114000	00025	LD	DE,64	;DE=LENGTH OF FULL LINE
7FE6 19	00026 LOOP1	ADD	HL,DE	;LOOP DOWN SCREEN
7FE7 10FD	00027	DJNZ	LOOP1	
7FE9 ED52	00028	SBC	HL,DE	
	00029 ;			;ADJUST FOR ADDITIONAL
7FEB F1	00030	POP	AF	;COUNT AT XX1
7FEC 163C	00031	LD	D,3CH	;RESTORE X VALUE
7FEE 5F	00032	LD	E,A	;DE=POSITION ACROSS
7FEF 19	00033	ADD	HL,DE	;SCREEN.
	00034 ;			;ADD DISPLACEMENT DOWN
7FF0 222040	00035	LD	(4020H),HL	;SCREEN.
	00036 ;			;SAVE IN CURSOR POINTER
7FF3 2AFD7F	00037	LD	HL,(TMPS)	;ADDRESS.
7FF6 CF	00038	RST	08H	;RESTORE COMMAND POINTER
7FF7 29	00039	DEFB	29H	;SN ERROR IF NOT ")"
7FF8 CF	00040	RST	08H	
7FF9 2C	00041	DEFB	2CH	;SN ERROR IF NOT ","
7FFA C3AD20	00042	JF	20ADH	
7FFD 0000	00043 TMPS	DEFW	0H	;JUMP TO PRINT ROUTINE
7FB8	00044	END	7FB8H	;WORKSPACE
00000 TOTAL ERRORS				

***** SHORTEN 32K m/l DISK

by Spencer George *****

This is a machine language program for a 32K disk system, it may be modified for a 16K or 48K machine by altering the ORG statement to 7400H for 16K FE00H for 48K. The version listed loads from BE00 to BEC8.

The program SHORTENS basic programs by removing unnecessary blanks, linefeeds and REMark statements. The program is fairly simple-minded in its operation, i.e. no checks are made to see if the REM statement being removed is a GOTO or GOSUB branch line, therefore you should ALWAYS make sure that you SAVE a copy of the program to disk first, which is not only good sense, but will be handy for cross checking later in case any REM's were a GOTO or GOSUB destination. Better still, don't make REM's the destination for a GOTO or GOSUB in the first place, it's not good programming practise. Having thus cautioned you against what it doesn't do, what it does do is very useful and very quick. To use SHORTEN follow these very simple steps:-

1. Go into BASIC and LOAD"program/BAS"
2. Save your program back to disk..... SAVE"oldname/BAS"
3. Jump back to DOS by pressing reset or type ... CMD"S"
4. Start the m/l program by typing SHORTEN or SHORTEN/CMD
5. Jump back to the altered program by typing...BASIC * so that the pointers are not reset.
6. Save the program back to disk... SAVE"newname/BAS"

Alright, the smarty at the back of the class just typed ?MEM and got the same answer back as he did before the program was SHORTENed, but look!! All the REM's and blanks have gone - why the same answer to ?MEM. Simple...we returned to BASIC from DOS with the command BASIC* which does not reset the pointers so that our program will still be there and the pointers are still set to the value of the old version. To see how much memory you have saved try this.....

1. Type ?MEM or PRINT MEM and make a note of the number.
2. Provided you saved the program to disk as SAVE"newname/BAS" then return to DOS as in STEP 3 above.
3. Return to BASIC, this time resetting the pointers, by typing BASIC.
4. Type LOAD"newname/BAS"
5. Now type ?MEM or PRINT MEM and compare it to the value obtained in step 1 to see how much memory has been saved.

When you are satisfied that your program is still functioning correctly, i.e. no UL ERROR messages, then return to DOS and type KILL oldname/BAS then RENAME newname/BAS oldname/BAS

ENTERING THE PROGRAM

You may enter the program using the M - command in DEBUG or by using a disk-based editor/assembler. If you use DEBUG you will need to use the TRSDOS DUMP command to transfer the program from memory to disk with the following parameter:

	FILESPEC SHORTEN/CMD	START BE00	END BEC8	ENTRY BE00
BE00	00001	ORG	OBE00H	
BE00 D9	00002 AAN	EXX		
BE01 0605	00003	LD	B, AAD	
BE03 D9	00004 AAD	EXX		
BE04 08	00005	EX	AF, AF'	
BE05 3E00	00006	LD	A, AAA	
BE07 08	00007	EX	AF, AF'	
BE08 DD21A440	00008	LD	IX, AAM	
BE0C DD5E00	00009	LD	E, (IX+00H)	
BE0F DD5601	00010	LD	D, (IX+01H)	
BE12 DD6E00	00011	LD	L, (IX+00H)	
BE15 DD6601	00012	LD	H, (IX+01H)	
BE18 010400	00013	LD	BC, AAC	
BE1B EDB0	00014	LDIR		
BE1D 08	00015 AAP	EX	AF, AF'	
BE1E 3C	00016	INC	A	
BE1F 08	00017	EX	AF, AF'	
BE20 7E	00018	LD	A, (HL)	
BE21 FE00	00019	CP	AAA	
BE23 281D	00020	JR	Z, AAR	
BE25 FE22	00021	CP	AAH	
BE27 283A	00022	JR	Z, AAU	
BE29 FE93	00023	CP	AAK	
BE2B 2849	00024	JR	Z, AAX	
BE2D FE27	00025	CP	AAI	
BE2F CA76BE	00026	JP	Z, AAX	
BE32 FE0A	00027	CP	AAF	
BE34 2876	00028	JR	Z, ABE	
BE36 FE20	00029	CP	AAG	
BE38 2826	00030	JR	Z, AAT	
BE3A FE3A	00031	CP	AAJ	
BE3C 2872	00032	JR	Z, ABF	
BE3E EDA0	00033 AAQ	LDI		
BE40 18DB	00034	JR	AAP	
BE42 EDA0	00035 AAR	LDI		
BE44 EDA0	00036	LDI		
BE46 7E	00037	LD	A, (HL)	
BE47 FE00	00038	CP	AAA	
BE49 280B	00039	JR	Z, AAS	
BE4B 010300	00040	LD	BC, AAB	
BE4E EDB0	00041	LDIR		
BE50 08	00042	EX	AF, AF'	
BE51 3E00	00043	LD	A, AAA	
BE53 08	00044	EX	AF, AF'	
BE54 18C7	00045	JR	AAP	
BE56 EDA0	00046 AAS	LDI		
BE58 CDF81A	00047	CALL	AAL	
BE5B D9	00048	EXX		
BE5C 10A5	00049	DJNZ	AAO	
BE5E D9	00050	EXX		
BE5F C9	00051	RET		
BE60 23	00052 AAT	INC	HL	
BE61 18BA	00053	JR	AAP	
BE63 EDA0	00054 AAU	LDI		
BE65 7E	00055 AAV	LD	A, (HL)	
BE66 FE00	00056	CP	AAA	
BE68 28D8	00057	JR	Z, AAR	
BE6A FE22	00058	CP	AAH	
BE6C 2804	00059	JR	Z, AAW	
BE6E EDA0	00060	LDI		
BE70 18F3	00061	JR	AAV	
BE72 EDA0	00062 AAW	LDI		
BE74 18A7	00063	JR	AAP	
BE76 08	00064 AAX	EX	AF, AF'	
BE77 FE07	00065	CP	AAE	
BE79 F28FBE	00066	JP	P, ABB	
BE7C 08	00067	EX	AF, AF'	

BE7D 1B	00068	DEC	DE
BE7E 1A	00069	LD	A, (DE)
BE7F FE3A	00070	CP	AAJ
BE81 2001	00071	JR	NZ, AAY
BE83 1B	00072	DEC	DE
BE84 1B	00073 AAY	DEC	DE
BE85 1B	00074	DEC	DE
BE86 1B	00075 AAZ	DEC	DE
BE87 23	00076 ABA	INC	HL
BE88 7E	00077	LD	A, (HL)
BE89 FE00	00078	CP	AAA
BE8B 2805	00079	JR	Z, ABC
BE8D 18F8	00080	JR	ABA
BE8F 08	00081 ABB	EX	AF, AF'
BE90 18F4	00082	JR	AAZ
BE92 08	00083 ABC	EX	AF, AF'
BE93 FE07	00084	CP	AAE
BE95 F2A9BE	00085	JP	P, ABD
BE98 08	00086	EX	AF, AF'
BE99 23	00087	INC	HL
BE9A EDA0	00088	LDI	
BE9C 7E	00089	LD	A, (HL)
BE9D FE00	00090	CP	AAA
BE9F 28B5	00091	JR	Z, AAS
BEA1 010300	00092	LD	BC, AAB
BEA4 EDB0	00093	LDIR	
BEA6 C31DBE	00094	JP	AAP
BEA9 08	00095 ABD	EX	AF, AF'
BEAA 1896	00096	JR	AAR
BEAC 23	00097 ABE	INC	HL
BEAD C31DBE	00098	JP	AAP
BEB0 23	00099 ABF	INC	HL
BEB1 7E	00100	LD	A, (HL)
BEB2 FE00	00101	CP	AAA
BEB4 288C	00102	JR	Z, AAR
BEB6 2B	00103	DEC	HL
BEB7 1885	00104	JR	AAQ
BEB9 08	00105	EX	AF, AF'
BEBA FE07	00106	CP	AAE
BEBC F28FBE	00107	JP	P, ABB
BEBF 08	00108	EX	AF, AF'
BECO 1B	00109	DEC	DE
BEC1 1B	00110	DEC	DE
BEC2 1B	00111	DEC	DE
BEC3 1B	00112	DEC	DE
BEC4 18C0	00113	JR	AAZ
0000	00114 AAA	EQU	0000H
0003	00115 AAB	EQU	0003H
0004	00116 AAC	EQU	0004H
0005	00117 AAD	EQU	0005H
0007	00118 AAE	EQU	0007H
000A	00119 AAF	EQU	000AH
0020	00120 AAG	EQU	0020H
0022	00121 AAH	EQU	0022H
0027	00122 AAI	EQU	0027H
003A	00123 AAJ	EQU	003AH
0093	00124 AAK	EQU	0093H
1AF8	00125 AAL	EQU	1AF8H
40A4	00126 AAM	EQU	40A4H
BE00	00127	END	AAN
00000	TOTAL ERRORS		

***** POKER L2/16K

by S. Franzon *****

When the game starts five cards are displayed on the screen face down, the program asks you to BET by pressing the "B" key. One credit is subtracted from your total credit of 10 each time that you press "B". When you have bet the desired amount press "D" to draw, the cards will then be turned over. You should now decide which cards to keep. To keep a card, type the number that appears above each card, the word HELD will appear over the respective card. To cancel HELD cards press "C". When you have HELD the cards that you wish to keep press "D" again and any card not HELD will be replaced with another one and displayed on the screen. Program logic will then decide what if anything you have won. Winning hands are based on the normal rules for POKER. The game continues until you run out of credits.

BETS = 1

CREDITS = 8

PAYOUTS

TWO PAIR = 2	FULL HOUSE = 10	PRESS	1 - 5 TO HOLD CARDS
3 / KIND = 3	4 / KIND = 40		C TO CANCEL HELD CARDS
STRAIGHT = 5	STR/FLUSH = 100		D TO DRAW
FLUSH = 7	RYL/FLUSH = 400		

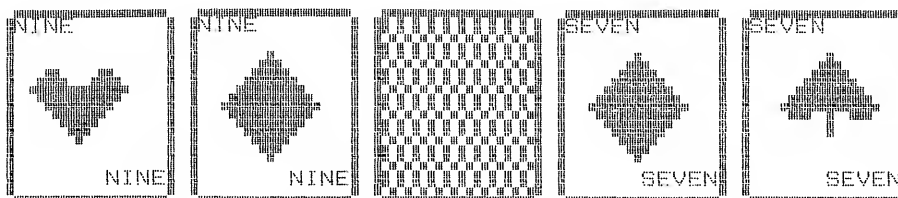
HELD

HELD

3

HELD

HELD



BETS = 3

CREDITS = 4

PAYOUTS

TWO PAIR = 2	FULL HOUSE = 10	PRESS	1 - 5 TO HOLD CARDS
3 / KIND = 3	4 / KIND = 40		C TO CANCEL HELD CARDS
STRAIGHT = 5	STR/FLUSH = 100		D TO DRAW
FLUSH = 7	RYL/FLUSH = 400		

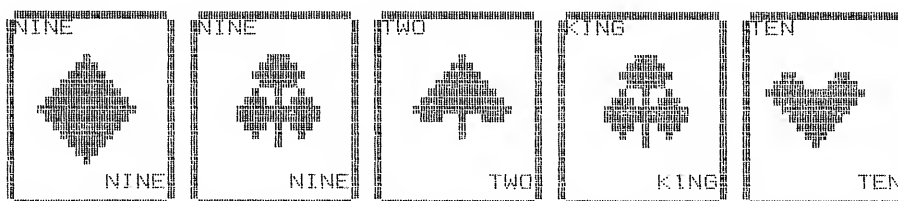
HELD

HELD

3

4

5



The program structure and variables are explained below.

100-130 Initialization.
 140-210 Screen set up-printing payouts and drawing cards.
 220-350 Randomly choosing cards, and check that each card isn't used twice.
 360-430 INKEY\$ to bet and to deal cards.
 Subs 450, 460, 470, 480, 490 are where the starting points for the graphics of each card are kept.
 500-640 INKEY\$ to hold cards and to redeal the cards.
 650-720 Replace the cards not held.
 730-780 Put the number values of each card (i.e. 1 for Ace, 2 for two...) into increasing order for checking wins.
 790-840 Check for winning branches to subroutines
 850 Check for 4/kind
 940 Check for 3/kind then full house.
 940 Check for pairs.
 1010 Check for flush then GOSUB 1050 to check for royal or straight flush.
 1050 Check for straight.
 After branching to each subroutine it checks if there was a win and it then will branch away if it is so.
 1080-1180 Prints out any winnings.
 1190-1250 INKEY\$ for double up or collect winnings.
 1260-1300 Print out double payments and draws card.
 1310-1350 INKEY\$ for choosing big or small.
 1360-1480 Checks for win or lose in double up and draws graphics on cards.
 1490 Checks if you have any credits left.
 1520-1540 Used when no win occurs.
 Sub 1550-1610 Draws outline of cards.
 Sub 1620-1640 Draws backing on cards and clears away backing.
 Sub 1650-1710 Draws suits on cards.
 Sub 1720-1890 Four different subs for setting graphics of each suit.
 Sub 1900-1950 Writes on the value of each card (i.e. Ace).
 Sub 1960-2010 Instructions.

The subroutines between 450-490 are used most commonly as they are called every time a change takes place to a card. The most important variables used are -

A\$(1-13) Written value of each card i.e. A\$(1)="ACE". A\$(2)="two".
 A(0-4) Hold the value for each of the card Nos. (i.e. 1 to 13)
 N.B. A(1) is card one, A(2) card two, etc.
 D(0-4) Holds the suit value (i.e. 1 to 4)
 B(0-4) Holds the value of A(0-4)+B(0-4)x20 (i.e. B(0)=A(0)+B(0)x20). This means every one of the 52 cards in the deck has a different B(0-4) value. Each value is checked against each other so no other card is the same.
 C(0-4) Holds the B(0-4) value when that card is being replaced (i.e. B(0-4) will get a new value and the old value is kept in C(0-4) and is checked against the new value so the same card can't be drawn after it was discarded.
 P(0-7) Hold the values of the payouts.
 V(0-4) Gets a value of one when it is held so the computer can tell which cards have been held.
 C holds the credit value
 M holds the bet value for each hand
 E Is the bet (M) x payout when a win takes place. It is equal to the amount won (i.e. bet 2, won 2 pair = 2 x 2 = 4)
 V Holds the value of the winnings (i.e. gets a different value for each different type of win)
 F Equals 165 when GOSUB 1620 to draw backing on card and equals 128 when used to clear backing.
 A,T,B,Y,Z,H are starting points for the outline of the card, the backing of the card and for drawing the graphics of the suit.

If you wish to start with more credits, change C (credits) in Line 40.

If you wish the payouts to be higher, change P(0-7) (payouts) in Line 120.

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40 RANDOM=C=10:DIMA$(13)
50 CLS:PRINT@405,CHR$(23); "P O K E R ";
60 PRINT@512, "DO YOU WANT INSTRUCTIONS <Y/N>";
70 A$=INKEY$: IFA$="GOTO70
80 IFA$="Y"GOSUB1960:GOTO100
90 IFA$<>"N"GOTO70
100 FORQ=1TO13:READA$(Q):NEXTQ
110 DATA"ACE","TWO","THREE","FOUR","FIVE","SIX","SEVEN","EIGHT",
"NINE","TEN","JACK","QUEEN","KING"
120 P(0)=2:P(1)=3:P(2)=5:P(3)=7:P(4)=10:P(5)=40:P(6)=100:P(7)=40
0
130 FORQ=0TO4:A(Q)=0:D(Q)=0:B(Q)=0:V(Q)=0:C(Q)=0:NEXTQ:Z=0:F=0
140 '***SCREEN SET UP***
150 CLS:PRINT@0,"BETS = ";M;:PRINT@48,"CREDITS = ";C;:PRINT@73,"
PAYOUTS";
160 PRINT@128,"TWO PAIR = ";P(0);:PRINT@192,"3 / KIND = ";P(1);:PR
INT@256,"STRAIGHT = ";P(2);:PRINT@320,"FLUSH = ";P(3);
170 PRINT@144,"FULL HOUSE = ";P(4);:PRINT@208,"4 / KIND = ";P(5)
;:PRINT@272,"STR/FLUSH = ";P(6);:PRINT@336,"RYL/FLUSH = ";P(7);
180 IFZ=1RETURN
190 FORR=1TO5:F=165
200 ONRGOSUB450,460,470,480,490:GOSUB1560
210 NEXTR
220 '***CHOOSING CARDS***
230 S=1:FORQ=0TO4
240 A(Q)=RND(13)
250 D(Q)=RND(4)
260 B(Q)=A(Q)+D(Q)*20
270 Y=0
280 IFB(Q)=C(Y)GOTO240
290 IFY=0THENY=Y+1:IFY=5GOTO320 ELSE280
300 IFB(Q)=B(Y)GOTO240
310 Y=Y+1:IFY=5THENGOTO320ELSE280
320 IFS=0GOTO350
330 IFS=1THENNEXTQ
340 GOTO370
350 GOTO680
360 '***PLACING BETS***
370 PRINT@163,"PRESS";
380 PRINT@233,"B TO PLACE BETS";
390 PRINT@297,"D TO DRAW";

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400 A$=" ":A$=INKEY$:IFA$=""GOTO400
410 IFA$="B"ANDC>=1THENC=C-1:M=M+1:PRINT@7,M;:PRINT@58,C;:GOTO40
0ELSEIFC<=0AND A$="B"THENPRINT@361,"YOU CAN'T BET ANY MORE.";:PRIN
T@425,"YOU'LL HAVE TO DRAW";:GOTO400
420 IFA$="D"ANDM=0THENPRINT@361,"YOU MUST PLACE A BET";:FORQ=1TO
1000:NEXT:PRINT@361,CHR$(30)ELSEIFA$="D"GOTO1650
430 GOTO400
440 '***STARTING POINTS FOR DRAWING CARDS***
450 A=451:T=514:B=525:Y=963:Z=515:H=583:RETURN
460 A=463:T=526:B=537:Y=975:Z=527:H=595:RETURN
470 A=475:T=538:B=549:Y=987:Z=539:H=607:RETURN
480 A=487:T=550:B=561:Y=999:Z=551:H=619:RETURN
490 A=499:T=562:B=573:Y=1011:Z=563:H=631:RETURN
500 '***HOLDING CARDS***
510 PRINT@233,CHR$(30);:PRINT@297,CHR$(30);:PRINT@361,CHR$(30);:
PRINT@425,CHR$(30);
520 PRINT@233,"1 - 5 TO HOLD CARDS";
530 PRINT@297,"C TO CANCEL HELD CARDS";
540 PRINT@361,"D TO DRAW";
550 PRINT@392,"1";:PRINT@404,"2";:PRINT@416,"3";:PRINT@428,"4";:
PRINT@440,"5";
560 A$=" ":A$=INKEY$:IFA$=""GOTO560
570 IFA$="1"THENPRINT@390,"HELD";:V(0)=1
580 IFA$="2"THENPRINT@402,"HELD";:V(1)=1
590 IFA$="3"THENPRINT@415,"HELD";:V(2)=1
600 IFA$="4"THENPRINT@427,"HELD";:V(3)=1
610 IFA$="5"THENPRINT@439,"HELD";:V(4)=1
620 IFA$="C"THENPRINT@384,CHR$(30);:FORQ=0TO4:V(Q)=0:NEXTQ:GOTO5
50
630 IFA$="D"THEN660
640 GOTO560
650 '***REPRINTING THE NEW CARDS***
660 S=0:FORQ=0TO4
670 IFV(Q)=0THENC(Q)=B(Q):GOTO240
680 IFV(Q)=0THENR=Q+1:ONRGOSUB450,460,470,480,490:F=165:GOSUB162
0
690 NEXTQ
700 FORQ=0TO4
710 IFV(Q)=0THENR=Q+1:ONRGOSUB450,460,470,480,490:F=128:GOSUB162
0:GOSUB1700
720 NEXTQ
730 '***PUTTING CARDS IN ORDER***
740 FORI=1TO4
750 FORJ=0TOI-1
760 IFA(J)>A(I)THENK=A(I):A(I)=A(J):A(J)=K
770 NEXTJ
780 NEXTI
790 '***CHECKING FOR WINS***
800 T=1:V=0
810 ONT6OSUB850,890,940,1010,1050
820 IFV=0THENT=T+1:IFT<>6GOTO810
830 FORQ=1TO1000:NEXTQ:GOTO1090
840 '***FOUR OF A KIND***
850 IFA(0)=A(1)ANDA(1)=A(2)ANDA(2)=A(3)THENV=1
860 IFA(1)=A(2)ANDA(2)=A(3)ANDA(3)=A(4)THENV=1
870 RETURN
880 '***THREE OF A KIND AND FULL HOUSE***
890 IFA(0)=A(1)ANDA(1)=A(2)THENV=2:IFA(3)=A(4)THENV=V+1
900 IFA(1)=A(2)ANDA(2)=A(3)THENV=2
910 IFA(2)=A(3)ANDA(3)=A(4)THENV=2:IFA(0)=A(1)THENV=V+1
920 RETURN
930 '***TWO PAIR***
940 P=0:IFA(0)=A(1)P=P+1
950 IFA(1)=A(2)P=P+1
960 IFA(2)=A(3)P=P+1
970 IFA(3)=A(4)P=P+1
980 IFP=2THENV=4
990 RETURN
1000 '***FLUSH***
1010 IFD(0)=D(1)ANDD(1)=D(2)ANDD(2)=D(3)ANDD(3)=D(4)THENV=5:GOSU
B1050
1020 IFV=6THENV=8
1030 RETURN
1040 '***STRAIGHT***
1050 IFA(0)+1=A(1)ANDA(1)+1=A(2)ANDA(2)+1=A(3)ANDA(3)+1=A(4)V=V+
6
1060 IFA(0)=1ANDA(1)+A(2)+A(3)+A(4)=46THENV=6
1070 RETURN

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1080 '***PRINTING UP WINNINGS***
1090 IFV=0GOTO1520
1100 CLS
1110 IFV=1THENE=P(5)*M:PRINT@400,"FOUR OF A KIND. COLLECT";E;
1120 IFV=2THENE=P(1)*M:PRINT@400,"THREE OF A KIND. COLLECT";E;
1130 IFV=3THENE=P(4)*M:PRINT@400,"FULL HOUSE. COLLECT";E;
1140 IFV=4THENE=P(0)*M:PRINT@400,"TWO PAIR. COLLECT";E;
1150 IFV=5THENE=P(3)*M:PRINT@400,"FLUSH. COLLECT";E;
1160 IFV=6THENE=P(2)*M:PRINT@400,"STRAIGHT. COLLECT";E;
1170 IFV=8THENE=P(7)*M:PRINT@400,"ROYAL FLUSH. COLLECT";E;
1180 IFV=11THENE=P(6)*M:PRINT@400,"STRAIGHT FLUSH. COLLECT";E;
1190 '***COLLECT OR DOUBLE UP***
1200 FORT=0T07:P(T)=P(T)*2*M:NEXTT
1210 PRINT@464,"DOUBLE UP - PRESS D";
1220 PRINT@528,"COLLECT WINNINGS - PRESS C";
1230 A$=INKEY$:IFA$=""GOTO1230
1240 IFA$="C"THENC=C+E:M=0:GOTO120
1250 IFA$<>"D"THENA$="":GOTO1230
1260 '***DOUBLE UP***
1270 Z=1:CLS:GOSUB160:PRINT@7,"DOUBLE PAYOUTS";
1280 GOSUB470:GOSUB1560
1290 A(2)=RND(13)
1300 D(2)=RND(4)
1310 PRINT@169,"PRESS B FOR BIG ";
1320 PRINT@233,"(LARGER THAN EIGHT)";
1330 PRINT@297,"PRESS S FOR SMALL";
1340 PRINT@361,"(SMALLER THAN EIGHT)";
1350 A$=INKEY$:IFA$=""GOTO1350
1360 IFA$="B"PRINT@809,"YOUR GUESS IS BIG";:GOTO1390
1370 IFA$="S"PRINT@809,"YOUR GUESS IS SMALL";:GOTO1400
1380 GOTO1350
1390 IFA$="B"ANDA(2)>8THEN1420
1400 IFA$="S"ANDA(2)<8THEN1420
1410 GOTO1460
1420 R=3:F=128:GOSUB470:GOSUB1620:GOSUB1700
1430 FORQ=1TO1000:NEXTQ
1440 CLS:E=E*2:PRINT@400,"CONgRATULATIONS - YOU GUESSED CORRECTL
Y";:PRINT@464,"COLLECT";E;" DOUBLE UP AGAIN PRESS D";
1450 FORQ=0T07:P(Q)=P(Q)*2:NEXTQ:GOTO1220
1460 R=3:F=128:GOSUB470:GOSUB1620:GOSUB1700
1470 FORT=1TO1000:NEXTT
1480 CLS:PRINT@400,"YOU GUESSED INCORRECTLY";:FORT=1TO500:NEXT
1490 IFC<=0THENCLS:PRINT@390,"SORRY - YOU'VE GOT NOTHING ELSE TO
PLAY WITH....";:FORQ=1TO3000:NEXT:CLS:END
1500 FORQ=1TO2000:NEXT
1510 M=0:GOTO120
1520 IFC<=0THEN1490ELSECLS:PRINT@338,"SORRY, YOU WON NOTHING";:P
RINT@466,"PRESS ANY KEY TO CONTINUE";
1530 A$=INKEY$:IFA$=""GOTO1530
1540 GOTO1510
1550 '***DRAWING UP CARDS***
1560 PRINT@A,STRING$(10,176);
1570 PRINT@Y,STRING$(10,131);
1580 PRINT@T,CHR$(170);:T=T+64:IFT>960GOTO1600
1590 GOTO1580
1600 PRINT@B,CHR$(149);:B=B+64:IFB>960THENF=165:GOTO1620
1610 GOTO1600
1620 PRINT@Z,STRING$(10,F);
1630 Z=Z+64:IFZ>960RETURN
1640 GOTO1620
1650 FORR=1TO5
1660 ONRGOSUB450,460,470,480,490
1670 F=128:GOSUB1620:GOSUB1700
1680 NEXTR
1690 GOTO510
1700 OND(R-1)GOSUB1720,1760,1790,1840:GOSUB1900
1710 RETURN
1720 H=H+61:PRINT@H,CHR$(184)+CHR$(191)+CHR$(180)+CHR$(176)+CHR$
(190)+CHR$(189)+CHR$(144);:H=H+64
1730 PRINT@H,CHR$(130)+CHR$(175)+STRING$(3,191)+CHR$(135);:H=H+6
4
1740 PRINT@H,CHR$(139)+CHR$(159)+CHR$(129);
1750 RETURN
1760 PRINT@H,CHR$(160)+CHR$(180);:H=H+63:PRINT@H,CHR$(184)+STRIN
G$(2,191)+CHR$(189)+CHR$(144);:H=H+63
1770 PRINT@H,CHR$(174)+CHR$(191)+CHR$(143)+CHR$(159)+CHR$(175)+C
HR$(191)+CHR$(132);:H=H+67:PRINT@H,CHR$(133);
1780 RETURN
1790 PRINT@H,CHR$(184)+CHR$(188)+CHR$(144);:H=H+63

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1800 PRINT@H,CHR$(162)+CHR$(143)+CHR$(159)+CHR$(167);:H=H+63
1810 PRINT@H,CHR$(168)+CHR$(191)+STRING$(2,189)+CHR$(191)+CHR$(1
89);:H=H+65
1820 PRINT@H,CHR$(139)+CHR$(129)+CHR$(149)+CHR$(139)+CHR$(129);
1830 RETURN
1840 PRINT@H,CHR$(184)+CHR$(144);:H=H+62
1850 PRINT@H,CHR$(160)+CHR$(190)+STRING$(2,191)+CHR$(180);:H=H+6
3
1860 PRINT@H,CHR$(136)+STRING$(5,191)+CHR$(157);:H=H+65
1870 PRINT@H,CHR$(130)+CHR$(175)+STRING$(2,191)+CHR$(135);:H=H+6
6
1880 PRINT@H,CHR$(139)+CHR$(129);
1890 RETURN
1900 B$(R-1)=A$(A(R-1))
1910 PRINT@Z-448,B$(R-1);
1920 P=LEN(B$(R-1))
1930 J=Y-54-P
1940 PRINT@J,B$(R-1);
1950 RETURN
1960 CLS:PRINT@20,"** P O K E R **"
1970 PRINT:PRINT
"  THIS GAME IS VERY SIMPLE TO PLAY. YOU START OF WITH TEN
  CREDITS AND YOU BET AS MANY AS YOU LIKE ON EACH HAND. THEN YOU
  DRAW THE CARDS AND SELECT THE CARDS YOU WANT TO HOLD. YOU THEN D
  RAW THE CARDS AGAIN AND YOU ARE TOLD IF YOU WON."
1980 PRINT:PRINT
"  IF YOU WIN YOU HAVE THE CHOICE TO DOUBLE UP OR TO COLLECT
  YOUR MONEY. IF YOU DOUBLE UP, YOU WAGER YOUR WINNINGS ON
  WHETHER A CARD IS BIG ( GREATER THAN EIGHT ) OR WHETHER IT IS  S
  MALL ( LESS THAN EIGHT ).";
1990 PRINT"IF YOU GUESS CORRECTLY, YOU WIN TWICE THE AMOUNT YOU
  ORIGINALLY WON. THE GAME CONTINUES UNTILL YOU RUNOUT OF CREDITS.
  G O O D  L U C K ..... "
2000 PRINT:INPUT"PRESS <NEW LINE> TO START PLAYING.";L
2010 CLS:RETURN

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***** SHIFTL m/l 16K by F. Ellett *****

Recently we wished to introduce a Quadriplegic friend of ours to computer programming. As she is able to use an electric typewriter with the aid of a wooden stick with a rounded knob on its end, we assumed the keyboard would present no extra difficulties for her.

However, our friend quickly discovered that without being able to lock the shift key down, shifted key tokens, like quotation marks, were not available to her.

And so the following program was developed. Firstly, as a simple scan reading for the shift key and then changing the next key to its shifted value. Then as it was apparent that we needed a fairly hefty key delay, we added your very useful Keytone delay and finally we added single key words for the alphabet characters.

As the program was written for a System 80 (to out sound to cassette port two) Tandy users should change byte 7FD7 from 05 to 01 and byte 7FDE from 06 to 02 to avoid toggling their cassette motor relay.

System 80 owners should be aware that sound is disabled after doing a CLOAD or CSAVE and need to perform an OUT 254,255 to relatch cassette port 2. We have chosen to use the U key for this command.

Shifted numeral 0 returns a null value and can be used to cancel a shifted key scan should shift be pressed in error.

Two finger typists should be aware that holding shift down whilst pressing another key will return its normal function. The program as presented resides at 7E50 to 7FEF, the entry point is 7E50. Memory should be protected at 32335.

The program can be considered as 3 blocks and relies on the fact that each time BASIC scans the keyboard, it jumps to an address in reserved RAM (4016H) before the interpreter processes the pressed key. By placing a jump to block 1. at 4016H, it is possible to modify the value of the pressed key before it is passed to the interpreter for processing.

BLOCK 1. Lines 500-650.

Block 1 simply looks to see if the shift key has been pressed. This is done by calling the keyboard switch matrix at 3880H. (The A register will contain 01H if the SHIFT key has been pressed in that scan).

If the SHIFT key has been pressed the jump address at 4016H is altered, forcing a jump to block 2 in each subsequent scan.

BLOCK 2. Lines 660-910

Block 2 knows SHIFT has been pressed, so it waits to capture the next key pressed. This is done by calling 03E3H each scan. (The A register will return with the ASCII value of any key pressed during that scan).

As a check against a two handed typist pressing both SHIFT and a letter together, the contents of the A register are masked so that values less than 2CH (comma) and greater than 5AH (capital Z) are returned unaltered.

Once a key within the desired range has been detected, the address at 4016H is altered yet again to point to Block 3.

Before control is returned though, the ASCII value of the key just pressed is used to access an address table and point to the character, or group of characters, that is to replace the pressed key. This address is saved in a special address buffer. The contents of A are zeroed then control is returned to BASIC.

BLOCK 3. Lines 920-1050

Block 3 is the write block. It calls 03E3H and then loads the A register with the replacement character, pointed to by the address buffer. It then increments the address buffer to point to the next character and returns to BASIC.

This routine is repeated over and over until a byte is discovered which has bit 7 set. Bit 7 is not used for ASCII characters and so makes a convenient end of text marker.

Once detected, the character is restored to its correct value by resetting bit 7, and the address at 4016H is changed for the last time to point again to the initial scan routine in Block 1.

That completes the substitution phase and the computer will operate in a normal fashion until the next shift key is detected. Because using a stylus to press the keys tended to cause a lot of key repeats, we felt it necessary to slow the keyscan rate down and chose to use an adaptation of the Keyboard Bleeper by C.E. Kendall (Micro-80 Nov. 80) as this had the added advantage of giving an audible indication of which key was pressed.

***** SHIFT LOCK *****

A PROGRAM TO ENABLE A DISABLED PERSON TO ENTER SHIFTED LETTERS

(C) F. ELLETT PALM BEACH, QLD. 1/8/1981

TO USE: PRESS AND RELEASE THE SHIFT KEY

THE NEXT KEY PRESSED WILL ASSUME ITS SHIFTED VALUE

KEYBOARD THEN RETURNS TO ITS NORMAL MODE

SHIFTED ALPHABET LETTERS WILL GIVE FULL KEY WORDS AS BELOW:-

A= ASC	B= CLS	C= CSAVE"A"	D= DATA
E= ELSE	F= FOR I=1TO	G= GOTO	H= GOSUB
I= INPUT	J= ", "	K= IK#= INKEY#	IF IK#="" THEN
L= LEN	M= MID\$(	N= NEXT	O= POKE
P= PEEK(	Q= CHR\$(	R= RETURN	S= STRING\$(
T= THEN	U= OUT254,255	V= VAL(	W= STR\$(
X= RIGHT\$(	Y= RND(	Z= LEFT\$(	O= NULL

READY

>

3C00	00100	ORG	3C00H
3C00 2A	00110	DEFM	'***** SHIFT LOCK *****'
3C40	00120	ORG	3C40H
3C40 41	00130	DEFM	'A PROGRAM TO ENABLE A DISABLED PERSON TO EN
TER SHIFTED LETTERS'			
3C80	00140	ORG	3C80H
3C80 28	00150	DEFM	'(C) F. ELLETT PALM BEACH, QLD. 1/8/1981'
3CC0	00160	ORG	3CC0H
3CC0 54	00170	DEFM	'TO USE: PRESS AND RELEASE THE SHIFT KEY'
3D00	00180	ORG	3D00H
3D00 54	00190	DEFM	'THE NEXT KEY PRESSED WILL ASSUME ITS SHIFTE
D VALUE'			
3D40	00200	ORG	3D40H
3D40 4B	00210	DEFM	'KEYBOARD THEN RETURNS TO ITS NORMAL MODE'
3D80	00220	ORG	3D80H
3D80 53	00230	DEFM	'SHIFTED ALPHABET LETTERS WILL GIVE FULL KEY
WORDS AS BELOW:-'			
3DC0	00240	ORG	3DC0H
3DC0 41	00250	DEFM	'A= ASC
D= DATA'			B= CLS
			C= CSAVE"A"

3E00	00260	ORG	3E00H		
3E00 45	00270	DEFM	'E= ELSE	F= FOR I=1TO	G= GOTO
H= GOSUB'					
3E40	00280	ORG	3E40H		
3E40 49	00290	DEFM	'I= INPUT	J= ", "	K= IK\$= INKEY
\$ IF IK\$="" THEN'					
3E80	00300	ORG	3E80H		
3E80 4C	00310	DEFM	'L= LEN	M= MID\$(	N= NEXT
O= POKE'					
3EC0	00320	ORG	3EC0H		
3EC0 50	00330	DEFM	'P= PEEK(	Q= CHR\$(	R= RETURN
S= STRING\$(
3F00	00340	ORG	3F00H		
3F00 54	00350	DEFM	'T= THEN	U= OUT254,255	V= VAL(
W= STR\$(
3F40	00360	ORG	3F40H		
3F40 5B	00370	DEFM	'X= RIGHT\$(	Y= RND(	Z= LEFT\$(
O= NULL					
4020	00380	ORG	4020H		
4020 803F	00390	DEFW	3F80H		
7E50	00400	ORG	7E50H		
7E50 E5	00410	INIT	PUSH	HL	
7E51 21657E	00420	LD	HL, START		
7E54 221640	00430	LD	(4016H), HL		
7E57 21077F	00440	LD	HL, WORDT		; START WORD TABLE
7E5A 22057F	00450	LD	(STORE1), HL		; SAVE ADDRESS
7E5D 3EFF	00460	LD	A, 0FFH		; SET SYSTEM 80
7E5F D3FE	00470	OUT	(254), A		; SECOND CASSETTE / SOUND
7E61 E1	00480	POP	HL		
7E62 C3CC06	00490	JP	06CCH		
7E65 CDE303	00500	START	CALL	03E3H	
7E68 F5	00510	PUSH	AF		; SAVE IT FOR A SEC
7E69 3A803B	00520	LD	A, (3880H)		; WHILE CHECK IF SHIFT
7E6C FE00	00530	CP	00		; PRESSED
7E6E 2007	00540	JR	NZ, NEXTKY		; JUMP TO IT IF IT IS
7E70 F1	00550	POP	AF		; NOT FOR US
7E71 FE00	00560	CP	00		
7E73 C4C27F	00570	CALL	NZ, SOUND1		; ORDINARY KEY PRESSED
7E76 C9	00580	RET			; SEND IT BACK
7E77 E5	00590	NEXTKY	PUSH	HL	
7E78 21847E	00600	LD	HL, WAIT		; SET WAIT LOOP
7E7B 221640	00610	LD	(4016H), HL		
7E7E E1	00620	POP	HL		
7E7F F1	00630	POP	AF		
7E80 CDC87F	00640	CALL	SOUND2		; SHIFT KEY PRESSED
7E83 C9	00650	RET			
7E84 CDE303	00660	WAIT	CALL	03E3H	; LOOK FOR OUR KEY
7E87 FE00	00670	CP	00		
7E89 CB	00680	RET	Z		
7E8A E5	00690	PUSH	HL		
7E8B FE2C	00700	CP	2CH		; IS IT LESS THAN ,
7E8D 3845	00710	JR	C, GOBACK		; GO BACK IF LESS
7E8F FE5A	00720	CP	5AH		; IS IT GREATER THAN Z
7E91 3041	00730	JR	NC, GOBACK		; THEN GO BACK
7E93 DDE5	00740	PUSH	IX		
7E95 DD21AA7E	00750	LD	IX, TABLE-2CH		; POINT IX TO TABLE
7E99 329E7E	00760	LD	(FINDAD+2), A		; SET IX TO CORRECT BYTE
7E9C DD7E00	00770	FINDAD	LD	A, (IX+00)	
7E9F 2A057F	00780	LD	HL, (STORE1)		; START OF WORD TABLE
7EA2 85	00790	ADD	A, L		; ADD TABLE DISPLACEMENT
7EA3 6F	00800	LD	L, A		; TO WORD TABLE POINTER
7EA4 3001	00810	JR	NC, NOCAR		
7EA6 24	00820	INC	H		; BUMP IT IF CARRY
7EA7 2B	00830	NOCAR	DEC	HL	; CORRECT POINTER
7EA8 22057F	00840	LD	(STORE1), HL		; SAVE WORD ADDRESS
7EAB 21B97E	00850	LD	HL, WRITE		; SET WRITE LOOP
7EAE 221640	00860	LD	(4016H), HL		
7EB1 AF	00870	XOR	A		; NULL UNWANTED CHARACTER
7EB2 DDE1	00880	POP	IX		
7EB4 E1	00890	POP	HL		
7EB5 CDCE7F	00900	CALL	SOUND3		; A SHIFTED KEY PRESSED
7EB8 C9	00910	RET			
7EB9 E5	00920	WRITE	PUSH	HL	
7EBA 2A057F	00930	LD	HL, (STORE1)		; START WORD ADDRESS
7EBD 23	00940	INC	HL		
7EBE 22057F	00950	LD	(STORE1), HL		; POINT TO NEXT LETTER
7EC1 7E	00960	LD	A, (HL)		; SEND HER OFF
7EC2 CB7F	00970	BIT	7, A		; IS IT LAST CHARACTER?

```

7EC4 280E      00980      JR      Z,GOBACK      ; CARRY ON IF NOT
7EC6 CBBF      00990      RES      7,A          ; TOGGLE BYTE IF LAST ONE
7EC8 21077F    01000      LD      HL,WORDT      ; RESTORE ADDRESS
7ECB 22057F    01010      LD      (STORE1),HL
7ECE 21657E    01020      LD      HL,START      ; RESET KEYBOARD JUMP
7ED1 221640    01030      LD      (4016H),HL
7ED4 E1        01040      GOBACK  POP      HL
7ED5 C9        01050      RET
              01060      ; TABLE STARTS HERE
7ED6 00        01070      TABLE  DEFB      00
7ED7 01        01080      DEFB      WT1-WORDT
7ED8 02        01090      DEFB      WT2-WORDT
7ED9 03        01100      DEFB      WT3-WORDT
7EDA 0F        01110      DEFB      WT0-WORDT
7EDB 04        01120      DEFB      WT4-WORDT
7EDC 05        01130      DEFB      WT5-WORDT
7EDD 06        01140      DEFB      WT6-WORDT
7EDE 07        01150      DEFB      WT7-WORDT
7EDF 08        01160      DEFB      WT8-WORDT
7EE0 09        01170      DEFB      WT9-WORDT
7EE1 0A        01180      DEFB      WT10-WORDT
7EE2 0B        01190      DEFB      WT11-WORDT
7EE3 0C        01200      DEFB      WT12-WORDT
7EE4 0D        01210      DEFB      WT13-WORDT
7EE5 0E        01220      DEFB      WT14-WORDT
7EE6 00        01230      DEFB      00
7EE7 01        01240      DEFB      WT1-WORDT
7EE8 02        01250      DEFB      WT2-WORDT
7EE9 03        01260      DEFB      WT3-WORDT
7EEA 04        01270      DEFB      WT4-WORDT
7EEB 10        01280      DEFB      A1-WORDT
7EEC 14        01290      DEFB      B1-WORDT
7EED 18        01300      DEFB      C1-WORDT
7EEE 20        01310      DEFB      D1-WORDT
7EEF 24        01320      DEFB      E1-WORDT
7EF0 29        01330      DEFB      F1-WORDT
7EF1 36        01340      DEFB      G1-WORDT
7EF2 3B        01350      DEFB      H1-WORDT
7EF3 41        01360      DEFB      I1-WORDT
7EF4 47        01370      DEFB      J1-WORDT
7EF5 4A        01380      DEFB      K1-WORDT
7EF6 65        01390      DEFB      L1-WORDT
7EF7 69        01400      DEFB      M1-WORDT
7EF8 6E        01410      DEFB      N1-WORDT
7EF9 73        01420      DEFB      O1-WORDT
7EFA 78        01430      DEFB      P1-WORDT
7EFB 7D        01440      DEFB      Q1-WORDT
7EFC 82        01450      DEFB      R1-WORDT
7EFD 89        01460      DEFB      S1-WORDT
7EFE 91        01470      DEFB      T1-WORDT
7EFF 96        01480      DEFB      U1-WORDT
7F00 A1        01490      DEFB      V1-WORDT
7F01 A5        01500      DEFB      W1-WORDT
7F02 AA        01510      DEFB      X1-WORDT
7F03 B1        01520      DEFB      Y1-WORDT
7F04 B5        01530      DEFB      Z1-WORDT
7F05 0000      01540      STORE1  DEFW      0000
              01550      ; WORD TABLE STARTS HERE
7F07 BC        01560      WORDT   DEFB      3CH+80H ; <
7F08 BD        01570      WT1     DEFB      3DH+80H ; =
7F09 BE        01580      WT2     DEFB      3EH+80H ; >
7F0A BF        01590      WT3     DEFB      3FH+80H ; ?
7F0B A1        01600      WT4     DEFB      21H+80H ; !
7F0C A2        01610      WT5     DEFB      22H+80H ; "
7F0D A3        01620      WT6     DEFB      23H+80H ; #
7F0E A4        01630      WT7     DEFB      24H+80H ; $
7F0F A5        01640      WT8     DEFB      25H+80H ; %
7F10 A6        01650      WT9     DEFB      26H+80H ; &
7F11 A7        01660      WT10    DEFB      27H+80H ; '
7F12 A8        01670      WT11    DEFB      28H+80H ; (
7F13 A9        01680      WT12    DEFB      29H+80H ; )
7F14 AA        01690      WT13    DEFB      2AH+80H ; *
7F15 AB        01700      WT14    DEFB      2BH+80H ; +
7F16 B0        01710      WT0     DEFB      80H      ; NULL CHARACTER
7F17 41        01720      A1       DEFM      'ASC'
7F1A AB        01730      DEFB      0ABH

```

7F1B 43	01740 B1	DEFM	'CLS'
7F1E A0	01750	DEFB	0A0H
7F1F 43	01760 C1	DEFM	'CSAVE"A'
7F26 A2	01770	DEFB	0A2H
7F27 44	01780 D1	DEFM	'DAT'
7F2A C1	01790	DEFB	0C1H
7F2B 45	01800 E1	DEFM	'ELSE'
7F2F A0	01810	DEFB	0A0H
7F30 46	01820 F1	DEFM	'FOR I = 1 TO'
7F3C A0	01830	DEFB	0A0H
7F3D 47	01840 G1	DEFM	'GOTO'
7F41 A0	01850	DEFB	0A0H
7F42 47	01860 H1	DEFM	'GOSUB'
7F47 A0	01870	DEFB	0A0H
7F48 49	01880 I1	DEFM	'INPUT'
7F4D A0	01890	DEFB	0A0H
7F4E 22	01900 J1	DEFM	'",'
7F50 A2	01910	DEFB	0A2H
7F51 49	01920 K1	DEFM	'IK\$=INKEY\$: IF IK\$="" THEN'
7F6B A0	01930	DEFB	0A0H
7F6C 4C	01940 L1	DEFM	'LEN'
7F6F A8	01950	DEFB	0A8H
7F70 4D	01960 M1	DEFM	'MID\$'
7F74 A8	01970	DEFB	0A8H
7F75 4E	01980 N1	DEFM	'NEXT'
7F79 A0	01990	DEFB	0A0H
7F7A 50	02000 O1	DEFM	'POKE'
7F7E A0	02010	DEFB	0A0H
7F7F 50	02020 P1	DEFM	'PEEK'
7F83 A8	02030	DEFB	0A8H
7F84 43	02040 Q1	DEFM	'CHR\$'
7F8B A8	02050	DEFB	0A8H
7F89 52	02060 R1	DEFM	'RETURN'
7F8F A0	02070	DEFB	0A0H
7F90 53	02080 S1	DEFM	'STRING\$'
7F97 A8	02090	DEFB	0A8H
7F98 54	02100 T1	DEFM	'THEN'
7F9C A0	02110	DEFB	0A0H
7F9D 4F	02120 U1	DEFM	'OUT254,255'
7FA7 A0	02130	DEFB	0A0H
7FA8 56	02140 V1	DEFM	'VAL'
7FAB A8	02150	DEFB	0A8H
7FAC 53	02160 W1	DEFM	'STR\$'
7FB0 A8	02170	DEFB	0A8H
7FB1 52	02180 X1	DEFM	'RIGHT\$'
7FB7 A8	02190	DEFB	0A8H
7FB8 52	02200 Y1	DEFM	'RND'
7FBB A8	02210	DEFB	0A8H
7FBC 4C	02220 Z1	DEFM	'LEFT\$'
7FC1 A8	02230	DEFB	0A8H
7FC2 E5	02240 SOUND1	PUSH	HL
7FC3 216030	02250	LD	HL, 3060H
7FC6 180A	02260	JR	SOUND4
7FC8 E5	02270 SOUND2	PUSH	HL
7FC9 218030	02280	LD	HL, 3080H
7FCC 1804	02290	JR	SOUND4
7FCE E5	02300 SOUND3	PUSH	HL
7FCF 219030	02310	LD	HL, 3090H
7FD2 F5	02320 SOUND4	PUSH	AF
7FD3 C5	02330	PUSH	BC
7FD4 4C	02340	LD	C, H
7FD5 45	02350 SOUND5	LD	B, L
7FD6 3E05	02360	LD	A, 05
7FD8 D3FF	02370	OUT	(OFFH), A
7FDA 10FE	02380 LOOP1	DJNZ	LOOP1
7FDC 45	02390	LD	B, L
7FDD 3E06	02400	LD	A, 06
7FDF D3FF	02410	OUT	(OFFH), A
7FE1 10FE	02420 LOOP2	DJNZ	LOOP2
7FE3 0D	02430	DEC	C
7FE4 20EF	02440	JR	NZ, SOUND5
7FE6 C1	02450	POP	BC
7FE7 F1	02460	POP	AF
7FE8 E1	02470	POP	HL
7FE9 C9	02480	RET	
7E50	02490	END	INIT
00000 TOTAL ERRORS			

***** MORSE CODE DECODER L2/4K

by R. Edwards *****

This program allows you to enter a series of dots and dashes representing morse code characters. It then translates those characters into the letters of the alphabet they represent.

The program works by converting an inputted string of dots, dashes and spaces into a decimal number by segments (each morse code letter) through a type of "binary" system.

Firstly a substring is taken between spaces, which is a morse code letter, the dots are equivalent to a 0 and dashes to a 1. Then this number is equated by raising 2 to this number plus its position from the right so that "." = 1, "-" = 2, ".." = 3 (left dot = 2, right dot = 1), "---" = 6, (left dash = 4, right dash = 2). This is more complicated than a simple binary conversion but was necessary to avoid dissimilar letter being confused.

Line 170 finds each space.

Line 180 keeps track of the first and second space and if one follows another a space is left on the screen (new word).

Line 190 defines some variables and the substring C\$ (the letter) and with line 200 steps through the string and does the abovementioned conversion.

Line 200 as above, then does a first check for the validity of input.

Line 210 is the second validity check if input is involved a branch to line 240 is made.

Line 220 prints the calculated character.

Line 230 checks for end of string, if so, awaits for a restart.

Line 240 is the branch when an error has been made, which requests a correction to be made.

Lines 250-320 is the input/correcting subroutine. If requested to correct input it will not allow you to alter any part of the string that has already been calculated. This subroutine may be used (with minor alterations) in other programs.

```
20 CLS: CLEAR1000: DIMA$(120): FORI=1 TO 28: READA$(I): NEXT: FORI=1 TO 18
: READX, A$(X): NEXT
30 DATA E, T, I, A, N, M, S, U, R, W, D, K, G, O, H, V, F, L, P, J, B, X, C, Y, Z, Q
40 DATA 120, 31, 5, 32, 4, 34, 3, 38, 2, 46, 1, 47, 6, 48, =, 49, /, 55, 7, 59, 8, 61
, 9, 62, 0, 75, ?, 84, ., 105, :, 114, ", " , 119, " : "
50 PRINT TAB(15) "MORSE CODE DECODER - INSTRUCTIONS
"TAB(15) "-----"
```

```
THIS PROGRAM USES A SIMPLE LINE EDITOR FOR THE INPUT AND
CORRECTION OF THE CODED MESSAGE. A GRAPHIC BLOCK WILL FLASH"
60 PRINT "OVER THE SPACE OR CHARACTER, WHICH CAN BE CHANGED BY TY
PING
OVER IT. THE < AND > KEYS (&.) CAN BE USED TO MOVE THE CURSOR,
SHIFT < WILL DELETE THE CURRENT CHARACTER, AND SHIFT > WILL
INSERT A SPACE. HIT ENTER TO RUN."
70 PRINT"
FOR THE INPUT OF MORSE CODE, TYPE THE K CHARACTER FOR DOTS AND
THE L CHARACTER FOR DASHES. INSERT A SPACE BETWEEN EACH LETTER,
AND TWO SPACES BETWEEN EACH WORD." : GOTO 150
80 CLS: PS=-1: P2=1: P1=1: A$="" : J=0: L=1: GOSUB 170
90 J=J+1: IF MID$(A$, J, 1) <> "." THEN 90
100 P1=P2: P2=J+1: IF P1+1=P2 THEN C=120: GOTO 140
110 C=0: L=P2-P1-1: C$=MID$(A$, P1, L): FORI=1 TO L: X=1: IF MID$(C$, I, 1) =
"." THEN X=0
120 C=C+2*(X+L-I): NEXT: IF C<0 OR C>119 GOTO 160
130 IF A$(C)="" GOTO 160
140 PS=PS+1: PRINT@PS, A$(C): X=PS-INT(PS/64)*64: IF X>58 PRINT: PS=PS
+64-X
150 IF J<LEN(A$) THEN 90 ELSE PRINT@960, "PRESS ENTER TO CONTINUE": IN
PUT Q$: GOTO 80
160 PRINT@960, "ERROR - PLEASE CORRECT OR DELETE": P=P1: L=LEN(A$)
: GOSUB 170: PRINT@960, CHR$(31): P2=P1: J=P1-1: GOTO 90
170 C=255+P: PRINT@C, CHR$(143): FORI=1 TO 25: S$=INKEY$: IF S$="" NEXT:
PRINT@C, MID$(A$, P, 1): FORI=1 TO 25: S$=INKEY$: IF S$="" NEXT: GOTO 170
180 PRINT@C, MID$(A$, P, 1): Q=ASC(S$): IF Q=32 OR Q=75 OR Q=76 THEN Q=-1: G
OTO 200 ELSE IF Q=13 RETURN ELSE IF Q=44 AND P>P1 THEN P=P-1 ELSE IF Q=46 AND P<L
THEN P=P+1 ELSE IF Q=60 AND P<L THEN S$="" : GOTO 210 ELSE IF Q=62 THEN S$="" +MID
$(A$, P, 1): GOTO 210
190 GOTO 170
200 IF S$="K" THEN S$="" ELSE IF S$="L" THEN S$=CHR$(95)
210 A$=LEFT$(A$, P-1)+S$+MID$(A$, P+1, L-P+1)
220 L=LEN(A$): PRINT@255+P, RIGHT$(A$, L-P+1) " : IF L>250 THEN A$=LEFT
$(A$, 249)+" : P=P-1: GOTO 220
230 IF Q=-1 THEN P=P+1: IF P>LEN(A$) THEN A$=A$+" "
240 GOTO 170
```

***** NEXT MONTH'S ISSUE *****

Next month's issue will contain at least the following programs plus the usual features and articles.

** TIC TAC TOE LI/4K **

Now this old family favourite has been written to run in a Level 1 4K machine. Play against your level 1 machine, complete with a graphic playing board.

** ATTACK LII/16K **

Shoot down the invaders before they bomb you. A two player space game, complete with sound effects and real time action as you try to beat the invader and your opponent.

** MULTIPLE REGRESSION LII/4K **

This is the third program in the series of scientific programs. This one relates a dependant variable with two other independent variables in respect to a surface and if any of that means anything to you, then this program is just for you.

** TEXT TYPER LII/16K **

A simple word processor program written in BASIC that lets you type in text with or without justification, save your text to tape and load it back, edit your text and lots more.

** BASIC LINE VALIDATOR m/1 **

This machine language program resides in an unused RAM area and when called it checks through your program for any unreferenced line numbers, reporting any errors that are found.

** ATOMIC TABLES LII/16K **

Students studying the subject of Atomic tables and Atomic numbers or anybody that is just interested, will find this program very useful. Did you know that there was an element called TECHNETIUM? We didn't until we ran this program!

APPLICATION FOR PUBLICATION
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IN MICRO-80

Date

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(ii) Publication on disk or cassette only
(iii) Both
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*** CHECK LIST ***

Please ensure that the cassette or disk is clearly marked with your name and address, program name(s), Memory size, Level 1, II, System 1 or 2, Edtasm, System, etc. The use of REM statements with your name and address is suggested, in case the program becomes separated from the accompanying literature.

Ensure that you supply adequate instructions, notes on what the program does and how it does it, etc.

For system tapes, the start, end, and entry points, etc.

The changes or improvements that you think may improve it.

Please package securely — padabags are suggested — and enclose stamps or postage if you want your cassette or disk returned.

***** CASSETTE EDITION INDEX *****

The cassette edition of MICRO-80 contains all the software listed each month, on cassette. All cassette subscribers need do is CLOAD and RUN the programs. Level II programs are recorded on side 1 of the cassette. Level I programs are recorded on side 2. Level I programs are not compatible with the System 80. All programs are recorded twice in succession. Note, System 80 computers have had different tape-counters fitted at different times. The approximate start positions shown are correct for the very early System 80 without the volume control or level meter. They are probably incorrect for later machines. The rates for a cassette subscription are printed on the inside front cover of each issue of the magazine.

The disk edition contains all those programs which can be executed from disk, including Level I programs. Level I disk programs are saved in the NEWDOS format. Users require the Level I/CMD utility supplied with NEWDOS + or NEWDOS 80 version 1.0 to run them.

SIDE ONE	TYPE	I.D.	DISK FILESPEC	APPROX. START POSITION		
				CTR-41	CTR-80	SYSTEM-80
MORSE DECODER	LII/4K	M	MORSE/BAS	15	10	10
"	"	"	"	37	25	26
POKER	LII/16K	P	POKER/BAS	60	40	42
"	"	"	"	118	80	84
PUT COMMAND	EDTASM	PUT	PUT/EDT	173	117	123
"	"	"	"	188	127	134
"	SYSTEM	"	PUT/CMD	200	136	143
"	"	"	"	205	139	146
SHIFT LOCK	EDTASM	SHIFTL	SHIFTL/EDT	210	142	150
"	"	"	"	255	172	180
"	SYSTEM	"	SHIFTL/CMD	296	200	210
"	"	"	"	310	209	220
SIDE TWO						
SHORTEN	EDTASM	SHORTN	SHORTEN/EDT	15	10	10
"	"	"	"	38	26	27
"	SYSTEM	"	SHORTEN/CMD	62	42	44
"	"	"	"	70	47	50

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MICRO-80

LEVEL II ROM REFERENCE MANUAL

by Edwin Paay

Published by MICRO-80 PRODUCTS

Written by Eddy Paay, the LEVEL II ROM REFERENCE MANUAL is the most complete explanation of the Level II BASIC interpreter ever published.

Part 1 lists all the useful and usable ROM routines, describes their functions explains how to use them in your own machine language programs and notes the effect of each on the various Z 80 registers.

Part 1 also details the contents of system RAM and shows you how to intercept BASIC routines as they pass through system RAM. With this knowledge, you can add your own commands to BASIC, for instance, or position BASIC programs in high memory—the only restriction is your own imagination!

Part 2 gives detailed explanations of the processes used for arithmetical calculations, logical operations, data movements, etc. It also describes the various formats used for BASIC, SYSTEM and EDITOR/ASSEMBLER tapes. Each section is illustrated by sample programs which show you how you can use the ROM routines to speed up your machine language programs and reduce the amount of code you need to write.

The LEVEL II ROM REFERENCE MANUAL is intended to be used by machine language programmers. It assumes a basic understanding of the Z 80 instruction set and some experience of Assembly Language programming. But BASIC programmers too will benefit from reading it. They will gain a much better insight into the functioning of the interpreter which should help them to write faster, more concise BASIC programs.

MICRO-80